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THE
ANCIENT RACES
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BEING

AN ANTHROPOMETRICAL STUDY
OF THE INHABITANTS OF UPPER EGYPT
FROM THE EARLIEST PREHISTORIC TIMES
TO THE MOHAMMEDAN CONQUEST
BASED UPON THE EXAMINATION OF OVER 1,500 CRANIA

BY

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OXFORD
AT THE CLARENDON PRESS

1905

Q 518-17
HENRY FROWDE, M.A.
PUBLISHER TO THE UNIVERSITY OF OXFORD
LONDON, EDINBURGH
NEW YORK

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INTRODUCTORY

THE present monograph is the report on a large number of crania found in the course of archaeological excavations in Egypt during the four seasons 1898-1901. The excavations were, with the exception of those at Regagnah, carried out at the expense and under the auspices of the Egypt Exploration Fund, and the archaeological results have already been recorded in a series of works which are referred to in the Appendix to this volume.

All the sites explored are situated in Upper Egypt in the district anciently known as the Thebaid. The specimens obtained from them comprise 1,500 crania, besides a certain number of bones of skeletons, the crania of which are wanting. As the collection was made by one of the authors who was on the spot and gave the closest attention to the archaeological evidence, it has been possible to distribute it into eleven different chronological periods, and thus to make a comparative study which may be called a physical history.

The number of specimens of each period is as follows:

Early Predynastic; from the three sites of El-Amrah, Hou, and Abydos	115
Late Predynastic; from the two sites of El-Amrah and Hou	263
First Dynasty; from the three sites of El-Amrah, Hou, and Abydos	104
Royal Tombs of the First and Second Dynasties from Abydos	42
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Roman period from Denderah	100

A complete list, showing exactly how many of these, Male and Female, were obtained from each site, will be found in the Appendix, p. 113.

We have also published in the Charts and Appendix the measurements of sixty-three skulls of the Fourth and Fifth Dynasties which were found, not in the Thebaid, but at Deshasheh and Medum in Middle Egypt. These have not been analysed in detail, but have been utilized for comparison with our own material. For the use of them we are indebted to the courtesy of Professor W. M. Flinders Petrie and Dr. Garson, who took the measurements.

The 1,500 skulls from the Thebaid were measured by one of the authors¹, with the exception of those from El-Amrah. Of these latter the majority were measured by Mr. T. A. Joyce, who was at that time working with the authors in the University Museum at Oxford; while some which had been deposited at Cairo were measured

¹ They were measured on the actual sites of the excavations except those from Regagnah, which were brought to England for the purpose.

by Professor G. Elliot Smith and his assistant. To these gentlemen cordial thanks are due.

The total number of specimens available for the present study thus consisted of 1,561 skulls, 711 partial skeletons belonging to the skulls, and 154 skeletons of which the skulls had perished. We deal here only with the skulls, except in cases where it is necessary to touch on the question of limb-length as an indication of stature. Accordingly, we do not publish the measurements of the limbs, but those who wish to pursue any branch of inquiry for which they are necessary will find a considerable amount of material in 'Denderah' (Seventeenth Memoir of the Egypt Exploration Fund), where the chief limb-measurements are given for the Sixth to Twelfth Dynasties, the Ptolemaic and the Roman periods. The letter S accompanying the catalogue-number of any specimen in the list of skull-measurements given in our Appendix indicates that the specimen in question has a partial skeleton belonging to it.

The reader must not suppose, however, that there is a collection of 1,500 of these crania in the Museum at Oxford. The expense and difficulty of transport prevented the conveyance to England of all the specimens discovered in the course of excavation, and many were re-interred after they had been measured. But a considerable collection of crania from several of the sites, including many of the specimens of which measurements are here given, was presented to the Cambridge Museum; besides which the University of Aberdeen and the Medical School at Cairo possess a certain number from El-Amrah.

Our own collection, which was presented to the Department of Human Anatomy of the University Museum at Oxford, consists of 200 skulls and 100 partial skeletons (together with a considerable number of separate bones), belonging mainly to the first five periods. We have reproduced in Plates IV-IX the photographs of all that were sufficiently perfect to show the characteristic features. Of the remainder, some had been found already broken in the graves, and others had suffered damage in transit. The fragile nature of the specimens sufficiently explains why in the tables of absolutes, and charts of indices, some of the measurements are occasionally wanting.

With regard to the scheme of the book, we have endeavoured to examine the material at our disposal by most of the methods now in vogue, and have introduced innovations which are intended to facilitate the study of correlated features. The first chapter is devoted to such an outline of the history and archaeology as it was thought might be serviceable to those workers who have not the leisure or opportunity to study that special subject; the second chapter gives an account of the measurements employed in this work and some new views upon the character of some of them. Chapters III-VIII inclusive set out the various methods which have been used in dealing with the material, and detail the results obtained by each method. Chapters IX-XII summarize the most valuable points of evidence obtained from the combination of methods, and state the general theories which we deduce from them.

All matter which is necessary for reference, but of which the inclusion in the text would have obscured the treatment, has been relegated to an Appendix. In this Appendix will be found a full list of all the absolute measurements of the skulls. It has been arranged as an inset, so that it can readily be detached and used separately by those who may wish to work upon it independently. The indices are not printed in this catalogue, but will be found in the two large Charts which accompany the volume, to which we would direct particular attention. These Charts contain the principal

features which have been studied for each skull, viz. the Cephalic, Vertical, Facial and Nasal Indices, the Facial Projection and the Estimated Capacity. The catalogue-number of each individual specimen is entered in its proper place for every one of these six features, and thus a Curve of Frequency is formed. Accordingly by glancing from one table to another the reader can obtain an idea of all the chief characteristics of any required specimen. We must state from experience that such an investigation is not very laborious; though of course it must be remembered that sometimes owing to defective condition a skull will not appear in all six tables.

The Curves of Frequency are accompanied in the Charts by Curves of Probability, showing the form which the diagram ought in each case to assume if it conformed exactly to the Law of Errors. These Curves of Probability and their mathematical properties were worked out by Mr. Frank Porter, M.A. To him we are also indebted for Chapter VII, which he wrote in consultation with us.

CHAPTER I

OUTLINES OF THE HISTORY AND ARCHAEOLOGY

The Archaic
Periods.

It is less than ten years since the earliest limit of Egyptian archaeology was unanimously placed at the Fourth Dynasty. The dawn of history was to be synchronous with the building of the Pyramids; and although the lists recorded three Dynasties as reigning before Khafra and Khufu and Mycerinus, yet the kings assigned to them were regarded as scarcely less mythical than the demi-gods who were their legendary fore-runners. In 1895, however, Professor Flinders Petrie and Mr. J. E. Quibell discovered at Nagada and Ballas a series of cemeteries representing a stage of civilization unlike anything previously known in Egypt; and very shortly afterwards M. de Morgan published a volume in which he broached the wholly new hypothesis that these remains belonged to a period earlier than any yet known to history. The discovery which he made at Nagada in 1896-7 of the tomb of Mena, the traditional founder of the First Dynasty, proved the correctness of M. de Morgan's theory; and the constantly accumulating evidence obtained since that time has placed the accuracy of his dating beyond all doubt.

Year by year the work of various archaeologists has disclosed fresh steps in the evolution of this early culture, tracing it from comparatively rude beginnings to its full maturity, and showing how it eventually merged in that of the First Dynasty. Finally, many of the actual tombs of Mena's successors of the First, Second, and Third Dynasties have been identified and explored; so that an almost unbroken sequence carries the archaeological record from a remote Predynastic period down to that of the great Pyramid-builders.

The trend of recent discovery has unquestionably been towards unification, and archaeologists, now that they can obtain a synthetic view of the whole earlier civilization, are inclining to regard that of the 'Old Kingdom' more as a continuation and development than as an independent phenomenon. But the amplification of detailed knowledge must not be allowed to obscure the fact that the entire tenor of Egyptian life and feeling was changed between the times revealed by the earliest cemeteries and the accession of the Fourth Dynasty. It is difficult to define the exact place of cleavage: the Third Dynasty seems on the one hand to lead naturally into the Fourth, and on the other hand to be no less naturally derived from the First and the Second. But if the First Dynasty itself is compared with what precedes it, various essential differences may be observed, so that at the present moment it seems as if the line of demarcation would be more correctly placed between the Predynastic and the Dynastic than between the Third Dynasty and its successors.

Unfortunately, however, any attempt at classification is closely conditioned by the first researches upon the subject: and the original discoverers could not of course command the full evidence which has since become available. They were naturally

impressed in the first instance by the peculiar aspects of this early life, and by its unlikeness to all that is known under the Old Kingdom. The remains of the First Dynasty, which were next brought to light, appeared to bear the same character, and to be equally dissimilar to those of the historic time. Consequently, before all the links in the chain had been completed, a premature division was established with a corresponding terminology. For Professor Petrie everything antecedent to the Fourth Dynasty belonged to his 'New Race,' while M. de Morgan, with equal ill-fortune, adopted the term 'Neolithic.' That 'New Race' is a misnomer has long been recognized, but the epithet is certainly less misleading in this connexion than 'Neolithic.' The detailed archaeological analysis, which has lately been carried out, enables us to assign the tombs in these cemeteries to their relative chronological positions, and one result of this increased accuracy has been to prove that copper occurs in the very earliest graves. If, therefore, classifications are to retain any value whatsoever, the term 'Neolithic' must no longer be applied to these primitive Egyptians, who, although they preferred flint for many purposes, were yet well acquainted with copper, and used it in their manufactures. It is not necessary to discuss here whether the roughly worked flints found on the surface of the desert were fabricated by the same people, or should rather be ascribed to some otherwise unknown inhabitants of the valley; but it can be affirmed unhesitatingly that no *cemetery* has yet attested the existence of a purely Neolithic period in Egypt.

The Archaic
Periods.

Since the first writers on the subject regarded the early civilization as a homogeneous whole and placed its lower limit only at the Fourth Dynasty, it will tend to avoid confusion if we adopt the same main division even at some sacrifice of consistency. It is then requisite to find a single name which will accurately describe these several periods; and the most satisfactory is perhaps 'Archaic,' which has already come into partial use. As an alternative 'Prehistoric' is comparatively unobjectionable; for though the first three dynasties are to be included under it, yet these are so far non-historic that they have left virtually no documentary or monumental records. In the present volume we shall employ one or other of these terms whenever it is necessary to consider the several periods as a single whole, in contrast to the 'Old Kingdom,' which begins with the Fourth Dynasty and includes the Fifth and Sixth.

The 'Archaic' itself will admit of further differentiation; and, accordingly, the 'Predynastic' should be distinguished from the first three dynasties, which may conveniently be grouped as 'Protodynastic.' Further, the Predynastic can be subdivided on a principle shortly to be explained, so that it will fall into two halves, which may be called respectively 'Early Predynastic' and 'Late Predynastic.'

This leads to the following classification:

<i>Archaic Periods</i> (from the earliest time at which cemeteries are found down to the Fourth Dynasty) include . . .	{	PREDYNASTIC — includes	{	Early Predynastic
				Late Predynastic
		PROTODYNASTIC — includes	{	First Dynasty
				Second Dynasty
				Third Dynasty

Of the Protodynastic periods there are, in the first place, two series of specimens which are closely dated by their connexion with the tombs of certain kings whose names have been identified. Those belonging to the First and Second Dynasties were found at Abydos in the Royal Tombs excavated by Professor Petrie, while those of the Third Dynasty come from Mr. J. Garstang's excavations at Regagnah. But it was only a small

The Archaic
Periods.

number of burials to which this exact method could be applied, and the great mass of the Archaic specimens have been dated by another system which must next be explained.

The enormous amount of material which was collected between the years 1895 and 1899 enabled Professor Petrie to carry out an invaluable work of minute analysis which has put it within the power of the archaeologist to assign any Archaic tomb to its relative chronological position. The methods and results of this analysis are fully described in *Diospolis Parva*, to which those who desire more detailed information must refer. Here it may be said briefly that, as it was impossible to establish a reckoning in years for the several stages of a civilization which is earlier than the first recorded date, an arbitrary scale was adopted. The whole period supposed to be Predynastic was distributed over a scale to which the arithmetical numbers 30 to 80 were attached. How many years or generations or centuries are represented by these fifty units still remains unknown; it is *relative*, not absolute, antiquity which is established. The numbers up to 30 were deliberately left unfilled in order to accommodate any discoveries of still earlier character. The earliest graves yet known were assigned to the figure 30, while 80 represented the close of the Predynastic epoch so far as its close had then been ascertained; and within these limits the graves were arranged according to the nature of their contents in an ordered sequence obtained from the digest of hundreds of combinations.

The Protodynastic period was still very imperfectly known when this scheme was drafted, and the event has proved that the limiting figure 80 corresponds in reality not to the close of the Predynastic time, but to an advanced point in the First Dynasty. This, of course, does not in any way invalidate the system, but merely requires us to regard the last units in the 'Sequence-dating' as belonging to the time of Mena and his successors. Since the accession of Mena is placed at about 4780 B.C., while according to the 'Sequence-dates' his reign falls at some point between the numbers 70 and 80, it may be said that the Predynastic periods extend back from an unknown length of time before 4800 B.C., while the Protodynastic begin at about that point¹.

Our Archaic specimens other than those which have been already referred to were obtained from three different sites, viz. Hou², Abydos, and El-Amrah. The cemeteries of Hou and El-Amrah ranged over the whole Predynastic and part of the Protodynastic

¹ The dates given in these historical summaries are throughout (in round numbers) those adopted by Prof. W. M. Flinders Petrie in his *History of Egypt*. It must be premised, however, that no approach to accurate chronology can be made until the Eighteenth Dynasty. For the Middle Empire, the Old Kingdom, and the Archaic periods there is a progressive increase in uncertainty; so that although we have given some figures which may be carried in the memory, it must be stated that there is a possible error of ± 1000 years for the date of Mena. The chronology of the Eighteenth and subsequent Dynasties is unanimously considered to be well established, but for all before that time there is a possibility of wide variation. The minimum antiquity is that assigned by some very distinguished German archaeologists, whose views are not by any means generally accepted, but may be quoted for purposes of comparison. According to their system of dating the first three dynasties are placed 'before 2500 B.C.'

The Fourth to Sixth Dynasties inclusive ('Old Empire')	circa 2500-2200 B.C.
Interval embracing Seventh to Eleventh Dynasties inclusive	" 2200-2000 "
Twelfth, Thirteenth, and Fourteenth Dynasties ('Middle Empire')	" 2000-1700 "
Domination of the Hyksos (Fifteenth and Sixteenth Dynasties)	" 1700-1575 "
Eighteenth Dynasty	" 1545 "

This is the dating adopted, for instance, in such a popular work as Dr. G. Steindorff's *Die Blütezeit des Pharaonenreichs* in Prof. E. Heyck's series of *Monographien zur Weltgeschichte*.

² More exactly Shekh Ali and Semaineh, which are some miles south of Hou; but the series has been referred to in work already published as coming from 'Hou,' which is a convenient and sufficiently accurate description.

period. The two cemeteries of Abydos, on the other hand, were closely delimited; one contained only graves of sequence-dates from 30 to 50, while the other was confined to sequence-dates 60 to 80, nearly all the graves in the latter being actually between 70 and 80. As the entire middle part of the sequence-dates was absent at Abydos these two cemeteries were taken as representative of the extremes, and the specimens from them were published as characteristically early and late, even before the exact point had been ascertained at which the First Dynasty makes its appearance. Further research has shown this arrangement to be substantially accurate. The accession of Mena, as has been stated, falls between 70 and 80 in the sequence-dating. It has been suggested on the evidence obtained from the Royal Tombs that there were two or three kings who reigned before Mena, and whether this is or is not the case, it is certain that the characteristics of the tombs of sequence-date 70 ally them more closely to the First Dynasty than to the Predynastic. Accordingly sequence-date 70 has been taken as the earliest limit of the Protodynastic for the present purpose; and only such of the Hou and El-Amrah graves as are subsequent to 70 have been classed as belonging to the First Dynasty. For the Abydos specimens it was considered better to adhere to the original division and to treat the later cemetery as a single whole, and consequently as belonging to the First Dynasty. The one or two specimens from it (detailed in the Appendix), which precede 70 by two or three units, will not in any case appreciably affect the series, and it seemed unjustifiable to separate them from the others. Having ascertained the limits of the First Dynasty, it was desirable to subdivide the Predynastic so as to obtain the most complete contrast possible, and the Abydos cemeteries offered a ready-made division. Accordingly sequence-date 50 has been taken as the latest limit of the Earlier Predynastic, and from 50 to 70 is termed Late Predynastic. In the series of Late Predynastic, however, there have further been included such examples as did not admit of minutely accurate sequence-dating, if they were clearly *Predynastic* and if there was not sufficient reason for supposing them to belong to the earlier division. (Cf. Appendix, p. 114.)

The Archaic Periods.

The characteristics of the several Archaic Periods may now be described in outline.

EARLY PREDYNASTIC PERIOD (sequence-dates 30 to 50).

The people of the Early Predynastic period, the first inhabitants of Egypt of whom we have any certain knowledge, had already attained to a comparatively advanced stage of culture at the moment when they come under our observation. Compared with the highly sophisticated and refined Egyptians of the Middle and New Empire they are, of course, barbarians. They were ignorant, if not of writing, at any rate of that hieroglyphic script which in the hands of their historical successors became such a powerful instrument of science. They were ignorant, too, of many of the arts which graced the life of later times; drawing was for them still in its infancy, and sculpture properly so called had not come into existence. But if they were barbarians they were far removed from savagery. Living a more or less settled life they employed themselves in agriculture and hunting, practised various industries, and even maintained a trading intercourse with far distant regions. Their houses, to judge from a model found at El-Amrah, were built of wattle and mud with wooden doors and windows. The people themselves would seem to have gone scantily clad; but this was from choice, not from necessity, for they wove excellent cloth in abundance, and the skins of their sheep and goats would have provided warmer

Early Predynastic Period (sequence-dates 30 to 50).

Early Pre-
dynastic
Period
(sequence-
dates 30 to
5c).

covering had it been required. In the remains of their settlements have been found various implements and articles of domestic use—cooking-pots, querns, and spindle-whorls, as well as the flint hoes with which they tilled the ground. But it is, of course, only from the contents of the tombs that it is possible to reconstitute the complete picture of their life and to judge of its variety and complexity.

Structurally the graves of the Early Predynastic period may be divided into three classes. The earliest are round holes, cut three or four feet down into the desert marl and only just wide enough to accommodate the body, which was never mummified but was merely wrapped in goatskin or sheepskin and reed matting, and laid in the contracted 'embryonic' posture. These are succeeded by oval or oblong pits five or six feet in depth, from which a third type was evolved owing to the necessity for a methodical disposition of the bulky jars and numerous small objects interred. The pit was now cut back at the bottom for a foot or two into the rock, and in the recess thus formed was laid the body wrapped in its cloth and sheepskin and mat, while the pottery and the larger of the other objects were placed in the pit beside it.

The character of the tomb-equipment proves that this primitive folk had at least the same general idea of a future life as their successors, who believed that the dead continued in the lower world to follow such occupations as had engrossed them during life. With the men were buried their weapons of war and the chase, beautiful flint knives and lances, or solid maces of finely polished stone, with sometimes a model of a boat, or clay figures of men and animals. The women were adorned with their ornaments and supplied with the accessories of the toilet. For necklaces they had strings of beads made of carnelian, steatite, haematite, serpentine, garnet, and lapis lazuli; or sometimes of such rarer materials as glazed stone, silver, or even gold in the form of a thin leaf moulded over a core of clay. In their hair they wore ivory pins and combs carved in the form of animals or birds, and on their wrists they had bracelets of ivory or shell. Generally, too, they took with them to the underworld the palettes on which malachite was ground for face-paint; the slates which served this purpose are carved in many different forms of birds and beasts, and often still show a stain of green in the hollow produced by the pebble rubber. Finally, with men and women alike were buried stone vases and quantities of fine and coarse earthenware vessels. Both the pottery and the stone were worked freehand without the aid of wheel or lathe, and the grace and even the symmetry of the finest examples must arouse the highest admiration. To fashion stone without the aid of any mechanical appliance demanded infinite skill and perseverance when the materials were not only the soft limestone and alabaster, but also such stubborn rocks as basalt, syenite, porphyry and breccia. The block was laboriously ground out with sandstone or emery; its surface was dexterously polished, and eventually it was shaped into a two-eared hanging vase, a cylindrical jar or shallow bowl.

The pottery, which affords a peculiarly interesting study, is incomparably finer than any which was made in subsequent times when the wheel was in general use. It may be considered as falling into seven different classes, which include an almost infinite variety of forms. Three of the classes are closely related, and comprise haematitic wares treated by different methods. The simplest variety has a uniform red colouring, obtained by firing the pots in such a way that the air circulated freely about them, so that the haematitic facing was subjected to no chemical alteration. A second class was produced by a modification in the process of burning; the pots were partially buried mouth

downwards in the ashes, and the consequent limitation of the air reduced the haematite to magnetic oxide, forming a lustrous black border to the brilliant red of the remaining surface. These two kinds of ware were probably of indigenous origin, though the existence in later times of an analogous red technique in Syria, as well as in North Africa, suggests that they represent a very widely diffused ceramic tradition. The Bronze age of Cyprus is prolific in similar types, which, however, were probably produced under Egyptian influence. A third variety is distinguished by its peculiar decoration, the plain red surface being painted with white patterns and designs, which are of the greatest interest, since they belong to a style which is perpetuated in modern Algeria, and may be traced throughout the geometrical art of North Africa from the Mediterranean to the Niger.

Early Pre-dynastic Period (sequence-dates 30 to 50).

Curiously similar to the last in respect of ornamentation, though otherwise wholly different in character, is a fourth class, which is unquestionably a foreign importation. This is a black slip ware with incised designs filled in with white, which is of extreme rarity in Egypt, but has been found in abundance on the Spanish site of Ciempozuelos. It occurs also in Sardinia, in Crete, and at Hissarlik, and closely resembles the black incised pottery of prehistoric Bosnia as well as the similar fabric which was reintroduced into Egypt just after the Twelfth Dynasty.

A remarkable type of jar makes its first appearance about halfway through the Early Predynastic period. It is characterized by horizontal ledge-handles placed one on each side of the vessel at the point where it attains its greatest diameter. These handles are treated as an ornamental feature, and are moulded with the finger into bold undulations. Precisely similar wavy-handled pots have been found on pre-Jewish sites in Palestine; and though attributable to a much later time the Palestinian examples, which can hardly have originated independently, are doubtless connected directly or indirectly with those which are now under consideration. No contemporary foreign source is known from which they could have been derived, and they may therefore be regarded as the survivals of an earlier style which was either the parent or the close relative of the Predynastic Egyptian.

A handsome and attractive pottery, which had a great vogue in the Middle Predynastic period, is not infrequent after the first stages of the Early Predynastic. It is decorated with designs and figures painted in a dull red on the rough yellowish clay. The earliest patterns are imitated from cordage and from marble; spirals then became very popular, and were succeeded by plant forms and by rude pictures of boats, of human figures and of animals. Besides these more decorative kinds, a rough-faced pottery of very coarse fabric was manufactured in a great variety of shapes, and is particularly familiar from the numerous large jars filled with the ashes of funeral feast or sacrifice which normally accompany the interments of this time.

. LATE PREDYNASTIC (sequence-dates 50 to 70).

The Late Predynastic is so intimately connected with the Earlier Predynastic period that it is almost an act of violence to divorce the one from the other. For the particular purposes of this volume, however, it was necessary to make some such division. We wished to arrange our series in such a way as to be able to examine the question whether the people of the Protodynastic time were or were not identical with those of the Predynastic. In order to do this it was advisable in the first instance to exclude those middle stages which might be merely transitional, and therefore misleading from the

Late Pre-dynastic (sequence-dates 50 to 70).

Late Pre-
dynastic
(sequence-
dates 50 to
70):

ethnological point of view. If it should appear that there are real ethnological differences between the earliest Predynastic and the First Dynasty, it will be reasonable to analyse the racial characteristics of the intervening period. If, on the other hand, no race differences can be detected between the representatives of the two most strongly contrasted phases of the Archaic civilization, it is highly improbable that they will be found where the cultural affinities are so much closer. What is named the Late Predynastic period is then merely the development and extension of the Early Predynastic. It is the same life, but fuller and wider. There is a perceptible increase in wealth and luxury; one or two new manufactures are introduced, and of those which have already been established some are carried to their culminating perfection, while others are forgotten or disused. The manufacture of pottery, for instance, gradually deteriorates. The haematitic wares especially fall into disfavour; for the black-bordered variety is gradually abandoned, and the white-ornamented pottery is no longer used, while the polished red enjoys indeed a brief popularity but is eventually ousted by inferior fabrics. The pottery with red painted designs is abundant however, and the wavy-handled jars for scented fat or palm oil are at first carefully and artistically made. It is about halfway through the period that decadence begins, and between sequence-dates 60 and 70 only three kinds of ware occur in any considerable quantity. These are the painted vases, from which the finer and more elaborate designs have now disappeared; the wavy-handled vases, in which the ornamental ledges are rapidly degenerating into mere excrescences roughly pitted with the finger; and a plain smooth-faced pottery, which replaces for all common purposes the rough-faced vessels of the earlier period.

On the other hand, the working of stone vases only attains its highest perfection towards the close of the earlier period, and is maintained at the same level until the First Dynasty, while the very finest of the flint implements are not found before the beginning of the Late Predynastic. It is the more remarkable that precisely at this stage metal begins to become abundant, and copper daggers are used which are indistinguishable in form from the earliest Cypriote types. In regard to personal ornaments it may be observed that ivory carving is less sedulously practised; but otherwise there is no considerable change, though some new materials, such as turquoise and amethyst, are introduced into the bead manufacture.

Before leaving the Predynastic period particular attention must be directed to the extent of the commerce which this early people maintained. Their gold, and much of their ivory, must have come from Nubia; garnets could not be found nearer than Abyssinia, and the turquoises were no doubt brought from the mines of Sinai. Their copper was imported from Sinai or Cyprus; and it has been remarked in connexion with the pottery that they must have kept up an intercourse with widely distant points of the Mediterranean, alike in the east and in the west. So early an establishment of trade-routes is in itself a fact no less interesting than unexpected; but, further, it is to the exigencies of commerce that the curious Mediterranean 'signary' owed its origin. This is composed of certain linear signs, which there is reason to believe form part of a common system which was diffused over Caria and Crete, North Africa and Iberia. As it appears in Egypt only in the form of isolated marks scratched upon the pottery the 'signary' defies interpretation, and little assistance is afforded by the very much later variants of it which have survived elsewhere. But its mere existence is important as indicating that even before the advent of hieroglyphs the different dwellers on the shores of the Mediterranean could communicate without the use of speech.

THE FIRST DYNASTY (from sequence-date 70 or a little before 4800 B.C. to 4500 B.C.).

The subject of writing naturally recalls the great innovation which accompanies the transition from the Predynastic to the Protodynastic, namely, the introduction of hieroglyphs. Whether hieroglyphs were altogether unknown in the latest Predynastic time is not quite certain; but, from the entire absence of any inscribed objects in all the hundreds of tombs known as earlier than sequence-date 60, there is the strongest reason for believing that at least in the *early* Predynastic period no script existed other than the rude signary described in the last paragraph. It is then a very remarkable circumstance that no sooner has the First Dynasty begun than hieroglyphic writing appears, and that too as an already matured system. Of its origins and embryonic stages no trace has as yet been found in Egypt, so that it is impossible to resist the conclusion that it was adopted, if not actually borrowed, from a system already elaborated by some more inventive nation. As the only country which has hitherto yielded evidence of a civilization in any degree comparable is Mesopotamia, it is reasonable in the present state of knowledge to consider that the Egyptian hieroglyphic script originated in the same region as the Cuneiform.

The First
Dynasty
(from
sequence-
date 70 or
a little before
4800 B.C. to
4500 B.C.).

The cultural revolution implied in this innovation was contemporary with political changes of no less magnitude. The establishment of the First Dynasty is a great landmark. Hitherto there had been no kings of Egypt; there may have been local chieftains, but they have left no indisputable proof of their existence, though it is natural to identify them with the owners of some exceptionally rich Predynastic tombs. But in the First Dynasty there are kings who describe themselves as rulers of Upper and Lower Egypt, who possess palaces, a court and a staff of officials, and who bear the titles and use the royal insignia familiar in the later historic records. Whether the consolidation of government proceeded from within, or was violently effected by foreign invaders, is a question which must be examined in the light of our anthropometrical data, for archaeological considerations cannot determine it. In either case, however, the new order cannot have been produced without warfare and the subjugation of rival claimants; so that when the pictorial records show one king or another in the act of chastising his foes, it is at least as likely that the vanquished are actually Egyptians as that they are the inhabitants of neighbouring lands. For the archaeology of the First Dynasty there are two sources of information, which are of very different value. These are respectively the tomb-equipment of private individuals from the lesser cemeteries of El-Amrah, Hou, and Abydos; and the relics of regal magnificence from the Royal Tombs of Abydos and the temple site of Hierakonpolis.

The private tombs of the First Dynasty differ in construction from those of the preceding period. The Late Predynastic graves resemble the earlier in being mere hollows sunk in the rock, though the shallow round holes have been abandoned in favour of the more roomy oblong and oval pits, with or without a rock recess. But in the First Dynasty a great improvement was introduced by the employment of brick; and at El-Amrah the most characteristic tombs of this date were walled quadrangular chambers, sunk indeed below the surface of the ground, but still buildings in embryo. As more care was given to details the walls were by degrees more carefully laid, the dimensions of the chamber were enlarged, and offering-recesses were added, until the perfected form reproduced all the essential features of the Royal Tombs of Abydos,

The First
Dynasty
(from
sequence-
date 70 or a
little before
4800 B. C. to
4500 B. C.).

from which in turn the mastaba and the pyramid were ultimately evolved. The furniture of the private graves testifies to an alteration in manners. Very few of the objects characteristic of the earlier people are found. In place of the beautiful and abundant pottery there will be only one or two jars and bowls, and these of very debased form. Stone vessels have become commoner, but are far less artistically made; copper is more generally used for implements and articles of dress; but there are none of the pretty ornaments on which the early people lavished their fancy and ingenuity. Were there indeed no other evidence for the art of the First Dynasty than is supplied from this source it would be considered to be remarkable for nothing but poverty and sheer stagnation. But the discoveries at Abydos and Hierakonpolis exhibit a very different picture. These make it clear that the changes which have just been noted are due to an altered current of taste and feeling, but in no degree to any loss of artistic sense or technical skill.

THE ROYAL TOMBS OF THE FIRST DYNASTY (4800 B.C. to 4500 B.C.) AND SECOND DYNASTY (4500 B.C. to 4200 B.C.).

The Royal
Tombs of the
First Dyn-
asty (4800
B. C. to 4500
B. C.) and
Second
Dynasty
(4500 B. C. to
4200 B. C.).

The magnificent luxury with which the kings of the first two dynasties were surrounded is indeed extraordinary. In their tombs at Abydos were found thousands of finely worked vessels of such costly materials as crystal, porphyry, diorite, serpentine, marble, and rare volcanic rocks, as well as of the commoner limestone, slate, and alabaster. Sometimes these were decorated on the surface with patterns in relief, and often they were inscribed with the name or title of the monarch for whom they were made. Metal work is abundant. Khasekhemui used bowls and ewers, plates and cups of hammered copper; and to his reign also belongs a hoard of votive copper tools. Gold was common enough to be used for the caps of marble vases and the plating of copper rods; it was also worked into pins and bracelets or delicately fashioned into graceful ornaments. The skill of the jewellers may be seen in the technique of the bracelets found in the tomb of Zer; the moulding, soldering, and chiselwork of the gold beads and plaques show the finished craftsman, and a fine sense of colour is evinced in the designs with their contrast of amethysts, turquoises, and lapis lazuli. It rarely happens that such precious ornaments have survived the many chances of theft and plundering; but in the sceptre of Khasekhemui, made of sardonyx and gold, may be recognized yet another object of the regalia. The long established art of glazing on stone was now practised on a more extensive scale, and the numerous votive objects from Hierakonpolis show its highest perfection. The minor decorative industries, moreover, were cultivated with assiduous attention and are represented by countless beautiful objects, such as ivory caskets and toilet dishes, supports of fauteuils, gaming pieces, carved tablets, ivory slips for inlay, and wands for use in the dance. Everywhere there are abundant signs of vigorous life and progress; only in one art is there any deterioration, and that is the ceramic. No fine pottery is any longer made, which is the more curious as the wheel now comes into use for the first time. But the demand seems to have ceased with the growing fondness for stone vessels, and the potters of the First and Second Dynasties were content in the main with reproducing debased copies of the most inferior of the later Predynastic types. Two new classes of ware may, however, be mentioned. One is a tasteless travesty of the haematitic polished-red, in which salmon-tinted burnishing

lines are used to produce an ornamental motive upon the light body-ground of the bowl or vase. The other is probably an importation and has been prematurely nicknamed 'Aegean'; its peculiar decoration is closely allied to that of the white-painted haematitic ware and of the foreign 'black incised,' and it is best to regard it as the offspring of the same stylistic tradition.

The Royal Tombs of the First Dynasty (4800 B.C. to 4500 B.C.) and Second Dynasty (4500 B.C. to 4200 B.C.).

The greatest advance made in the domain of art during the First and Second Dynasties has yet to be mentioned. The rudimentary drawings of the Predynastic people are like those of Bushmen or Red Indians, often spirited but always betraying the untrained intelligence. Their carving, which is shown at its best in ivory ornaments, is no whit superior to that of many savages. But the artists of the first two dynasties breathe a different atmosphere. Sculpture and bas-relief seem to be born in a moment; the limestone statues will bear comparison with the products of any period, the ivory figures of men and animals are masterpieces of the carver's skill, and in the scenes figured upon the mace-heads and the ceremonial slates may be recognized that command of form and naturalism of treatment which are henceforward the dominant characteristics of Egyptian style.

With the First Dynasty, indeed, we have already entered upon familiar ground. The inscriptions name cities famous in later days, and mention the selfsame deities that presided in all ages over the fortunes of Pharaoh and his subjects. The pictures and reliefs show such scenes of warfare as those which appear on the walls of later temples; the king himself is represented, here triumphing over his foes, there conducting a work of irrigation, dancing before his god or hunting in the marshlands. This is the life of the Egyptians, and these are the true beginnings of Egyptian history.

One difficult question arises in connexion with the skeletons from the Royal Tombs of Abydos. The social position of the owners of the private tombs of El-Amrah, Hou, and Abydos may be gauged to some extent by the varying degrees of richness in their funerary equipment, and a rough classification on these lines is given in the Appendix (pp. 115-117). But to determine the precise standing of the persons who were interred in the numerous small chambers round or near the central tomb of a king is by no means so simple. They were certainly closely connected with the Court; but were they merely domestics or were they nobles of the upper classes? The available evidence on the point is unhappily somewhat incomplete, owing to the circumstance that the site had been despoiled and almost everything displaced before opportunity was given for the genuinely scientific excavations which were eventually carried out under Professor Petrie, and which have yielded the material of our series. Some important points, however, have been ascertained, e.g. that the burials were not those of slaves, for articles of value were placed in the graves and inscribed stelae were erected over them. One of these stelae, moreover, gives the extremely important information that the person named Sabef, for whom it was carved, was a high official bearing the titles of 'governor of the residence' and 'friend of the palace,' and exercising various priestly functions. Again, many of the inscribed vases, of which fragments were scattered over the ransacked mounds, had originally been placed in the subsidiary tombs, and on them also the titles of various court dignitaries occur. There is good reason therefore to suppose that the majority of the individuals, whose skeletons were found on the site of the Royal Tombs, were officers of state and high ladies who wished to be buried in the immediate neighbourhood of the royal master whom they had served.

The Third Dynasty (4200 B.C. to 4000 B.C.).

The Third
Dynasty
(4200 B. C.
to 4000 B. C.).

Of the Third Dynasty nothing whatever was known until three years ago, when the first monuments of that period, the tombs of Kings Neter-khet and Sa-Nekht, were discovered by Mr. J. Garstang at Bêt-Khallâf. For a complete account of the archaeology the reader may be referred to the same excavator's memoir on Regagnah (see Appendix, p. 119). Here it is sufficient to say that the Third Dynasty exhibits precisely that transitional character which would be suggested by its chronological place. The most recent evidence therefore proves that the Protodynastic period is linked with that of the Old Kingdom, and that much at least of the civilization of the Pyramid-builders is a direct inheritance from the contemporaries and immediate successors of Menes. We are indebted to Mr. Garstang for sixteen skulls from his excavations at Regagnah, the measurements of which are given in the Appendix.

The Fourth and Fifth Dynasties (4000 B.C. to 3500 B.C.).

The Fourth
and Fifth
Dynasties
(4000 B. C. to
3500 B. C.).

The specimens dealt with in the present section were obtained at Medum and at Deshasheh. They belong to a period which is otherwise unrepresented, except by the very few skeletons from Regagnah. But it is important, moreover, to observe that they are the only series not derived from Upper Egypt, and consequently any racial peculiarities that they may present are quite as reasonably to be attributed to the difference in locality as to the difference in time. It is greatly to be wished that contemporary examples were available from Upper Egypt for purposes of comparison, but as yet nothing more than the nucleus of a series is extant in the few skulls from Regagnah.

Medum, which lies some forty miles south of Cairo, is sufficiently well known as the site of the pyramid built by King Sneferu. This king was the immediate or almost immediate predecessor of Khufu, and has hitherto been regarded as the founder of the Fourth Dynasty. A better opinion now makes him the last king of the Third Dynasty; but the distinction is unimportant for the present purpose, since the dating of these burials cannot be made accurate within the limits of a single reign. We shall therefore adhere to the older and more commonly received arrangement, and, without attempting to decide the point of exact division, shall include the reign of Sneferu with those of his successors when giving a *résumé* of the Fourth and Fifth Dynasties.

A cemetery which was excavated close to the pyramid of Medum contained mastabas and pit-tombs, from the latter of which come the skeletons which are here described. The structure and decoration of the mastabas and the character of their contents may be considered to place them after the Second and before the Sixth Dynasty. Any closer dating must be matter of some uncertainty, but the apparent connexion of the cemetery with the pyramid suggests that it is nearly contemporary with Sneferu, who seems to have been regarded as the tutelary genius of the place. The style of the pottery also is consistent with what is known of the Third and Fourth Dynasties; so that if the pit-graves belong—as it is natural to suppose—to the same period as the mastabas they may be assigned approximately to the Fourth Dynasty. The bodies found in them were laid in the contracted or embryonic posture which is characteristic of all the Archaic periods but not of those which are distinguished as historic.

At Deshasheh, which is less than thirty miles south of Medum, a cemetery was found with tombs of varied construction, rock-hewn chapels, mastabas, and simple pits, all of which appear to be contemporaneous. The main evidence of date was given by the names of Nenkheftka and Nenkhefthek, whose beautiful statues were discovered in their tombs. A Nenkheftka and a Nenkhefthek are also known at Sakkara, where their biographical inscriptions mention the names of Userkaf and Sahura, kings of the Fifth Dynasty; and as, further, the Deshasheh tombs closely resemble those of Sakkara in general character, there is every reason to regard them as identical in date. The evidence of the antiquities corroborates this view, for the pottery is very like that of Medum, only perhaps a little further developed; while the workmanship of the statues would alone justify their attribution to the most flourishing period of the Old Empire. Several methods of burial were in use at Deshasheh. Sometimes a coffin was employed, and sometimes none; while several of the bodies were buried in the contracted position, and others at full length. The most marked distinction, however, is between the cases where the body was buried intact and those in which it was partially dissevered, no doubt in consequence of re-burial. All the Deshasheh specimens have been included in a single group of tabulations and combined with the Fourth Dynasty series from Medum. In the Appendix, p. 119, will be found references to the archaeological memoir, in which the burials at Deshasheh are fully described.

The Fourth
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The Fourth Dynasty owes its universal fame to the great Pyramid-builders, Khufu, Khafra, and Men-kau-ra (Mycerinus); it is curious therefore to reflect that very little is known of them beyond the fact that they built these mighty monuments for themselves. A tablet of Mertitefs, who was Sneferu's queen, relates that she passed into the households first of Khufu and then of Khafra. His inscriptions show that Khufu fought against the natives of Sinai, that he executed some building on the temple-site of Bubastis, and that he worked the famous alabaster quarries near Tell-el-Amarna. Khafra has similarly inscribed his name on a block at Bubastis, and it is probable that he was the actual builder of the so-called 'Temple of the Sphinx' at Gizeh in which his portrait statues were discovered. A fragment of a portrait statue and a statuette are the only extant remains of Men-kau-ra, while the four or five kings who make up the remainder of the list are little more than names to the historian.

The most noteworthy point in connexion with the Fifth Dynasty is its strong religious policy. The sun-god Ra of Heliopolis was suddenly raised to a position of paramountcy; the words 'Son of the sun' were introduced among the royal titles, and temples such as that recently discovered at Abusir were erected by the kings in honour of their divine progenitor. This, the first of the religious revolutions which appear from time to time in Egyptian history, was accomplished it would seem without serious disturbance. The tranquillity, indeed, which prevailed throughout the Fifth Dynasty was broken only by an occasional razzia into the Sinaitic peninsula, intended to protect the Egyptian monopoly of the mines. The Royal Tombs were pyramids, of which the majority are probably at Abusir, though Unas, the last of the line, built the pyramid of Sakkara, on the walls of which are inscribed the earliest known religious texts. A tablet of this king at Elephantine is important as proving that the southern boundary of Egypt had already been extended to the First Cataract; and it is interesting also to read that Assa sent an officer as far as the land of Punt to obtain a pygmy for the diversion of the Court. The high standard at which architecture had now arrived is shown by the fine mortuary temple of Ne-user-Ra, recently discovered at Abusir. But it is from the

The Fourth
and Fifth
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mastabas of the princes and nobles of the time that the most complete view of Old Kingdom art and science may be obtained. The skill exhibited in the details of building is extraordinary, and would be almost inexplicable if it were not known that the hewing and fitting of stone had been practised ever since the reign of King Khasekhemui of the Second Dynasty. It is the decoration of these 'bench-tombs,' however, which invests them with their peculiar interest. The interior walls are adorned with bas-reliefs exhibiting every detail of contemporary life. The master of the tomb and his wife are seated watching the chase, their sons are snaring birds, and near them fishermen ply the net. Elsewhere the cattle and tame animals are depicted, the birds of the farm are being fed; in one scene there is sowing and ploughing, in another the harvesters are reaping the corn, and rams or donkeys are treading it out. Here the great noble is shown superintending the preparations for his own funeral, the building of the boat, the polishing of the statue, and the making of all the furniture; there again he is receiving the offerings which pious servants bring to the dead in fulfilment of the duty formally allotted to them. All these scenes are depicted, not only with a charming *naïveté*, but with a vivacity and fidelity to nature which was only sometimes equalled and never surpassed in later days. Only the human figure is unsatisfactory in the bas-reliefs, on account of the limiting conventions with which the artist fettered himself. But any such failure is amply atoned when the sculptor works in the round, and the portrait statues are the very finest of any period. Rahotep and Nefert, Nenkheftika and Nenkhefthek, the kneeling and the squatting scribes, and the famous Shekh-el-Beled are among the greatest masterpieces of Egyptian statuary. It is unfortunate that the knowledge of the minor antiquities is still incomplete owing to the dearth of material from recorded excavations. The wall-paintings of the tombs, however, show that many exquisite and delicate ornaments were manufactured; and in the pictures may be recognized such copper ewers and stone bowls as were actually found in the tomb of Ka-mena at El-Kab, as well as the sharp-rimmed bowls of that peculiar red ware which is the only distinctive ceramic product of the Fourth and Fifth Dynasties.

In conclusion, it should be noted that the Old Kingdom witnessed the birth of Egyptian literature. The inscriptions in the pyramids of Unas and his successors are the earliest religious texts extant; and the maxims of Ptah-hotep enshrine the wisdom of a Polonius who lived perhaps five thousand years ago.

From the beginning of the Sixth to the beginning of the Twelfth Dynasty
(3500 B.C. to 2780 B.C.).

From the
beginning of
the Sixth to
the begin-
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Twelfth
Dynasty
(3500 B.C. to
2780 B.C.).

The period which is described as between the Sixth and the Twelfth Dynasty has always been one of the most obscure in Egyptian history. Of its beginnings indeed a fairly clear picture may be formed, for there is a considerable amount of material extant which refers to the Sixth Dynasty itself (3500 B. C. to 3330 B. C.). The pyramid-tombs of its more important kings, Teta, Pepi I, Meren-ra and Pepi II, have been discovered at Sakkara; their walls covered with inscriptions, which are invaluable for the insight which they afford, not only into the structural development of the language, but also into the state of the religious beliefs of the time. Of still more interest to the historian are the biographies inscribed in the tombs of two great royal officers, Una and Her-khuf, which throw much light on the administration and the political condition of the country.

Numerous isolated inscriptions again testify to the activity of several monarchs in widely distant parts of their kingdom; and Pepi I, who is known to have engaged in extensive building operations, is even credited with the foundation of the original temple of Denderah.

In the Sixth Dynasty then the country would seem to have been ruled by a strong and well organized central government, which had extended its power in the north to the actual shores of the Mediterranean and in the south at least as far as Elephantine. There was sufficient tranquillity to permit the carrying out of important trade-expeditions, which went far south into the Soudan (inscription of Her-Khuf), the execution of monuments which employed great numbers of workmen in the quarries of the Wâdi-Hammamât and of Aswân, and the working of the turquoise mines in the Wâdi Maghâra. It was a time of industrial activity; and one of the campaigns chronicled in the inscriptions, a punitive expedition against the Menthu of Sinai, was undertaken in direct defence of trade interests, since it was from that district that the kings imported much of the copper which was so freely used for the manufacture of artistic objects. In the same reign, that of Pepi I, a similar raid was made upon the Aamu of Sinai (inscription of Una), the narrative of which is interesting from its mention of the fact that large levies were raised from the neighbouring tribes of the Soudan and of the western oases to fight in the Egyptian army. The royal tombs of the Sixth Dynasty are far inferior to the colossal pyramids of Gizeh, but those of the great nobles are built in a style well befitting their rank as district princes and governors. They are imposing brick mastabas of elaborate construction, which are partially panelled with stone slabs carved in bas-relief, and painted with scenes and inscriptions representing the offerings made to the deceased and describing his official rank, his interests and his achievements. In contrast to what is found to occur in the immediately subsequent period, it is noticeable that the most distinguished men of the Sixth Dynasty were content with the position of district prince or vizier in direct subordination to the king, and never arrogated to themselves the privileges or the titles of royalty.

The culture of the period shows a decline in some respects. The reliefs in the tombs are perhaps less carefully carved, and the execution of the hieroglyphic texts has perceptibly degenerated from the fine style of the preceding dynasties. But it can scarcely be said that the art of the Sixth Dynasty is as a whole inferior to that of the Fourth and Fifth. The copper figure of Pepi I, which was found at Hierakonpolis, is one of the most splendid achievements of Egyptian statuary, whether we regard the fineness of the conception or the skill of the execution. The tomb-furniture exhibits the most exquisite workmanship; no alabasters of any other period are so beautiful as those made for the wealthy ladies of this time. The most characteristic are the little collared vases with pointed ends, which are more distinctly representative of the period than the funnel shapes with spreading rims descended from similar types of the Fourth and Fifth Dynasties. But the highest level of minor art is reached with the working of diorite into vases, bowls, and dishes of such thinness as to be almost transparent. A delicate refinement indeed is the distinguishing feature of all Sixth Dynasty work, with the single exception of the pottery. But even the pottery, trumpery as it may be, is at least not worse than that of the immediately preceding periods; and it must be remarked that all Egyptian pottery is contemptible from the moment that the inspiration of the Predynastic time has been lost until some little life is reinfused into the forgotten craft by that wholesale introduction of foreign models which begins just after the Twelfth and culminates in the Eighteenth and Nineteenth Dynasties.

From the beginning of the Sixth to the beginning of the Twelfth Dynasty (3500 B. C. to 2780 B. C.).

From the
beginning of
the Sixth to
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Twelfth
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(3500 B. C. to
2780 B. C.).

The Sixth Dynasty links itself naturally to those which immediately precede it. Its canons of art and its workmanship are inherited from the Fourth and Fifth Dynasties, and it is rightly included with them as belonging to the *Old* Kingdom in opposition to the *Middle* Kingdom which begins with the Twelfth Dynasty. Between the Old and the Middle Kingdom there is a great gap; they are separated in tradition and feeling not less than in time. With the Twelfth Dynasty begins a new era, a civilization which has inherited comparatively little from the ages preceding it, but which dominates the whole subsequent development of Egyptian life.

What then was taking place during the 550 years which separate the Old from the Middle Kingdom? To the historian this had always been a dark period, and for the archaeologist it was a complete blank until the excavations at Denderah (1897-8) provided for the first time a quantity of material which could be definitely assigned to that interval. Historical documents are scanty between the Sixth and the Eleventh Dynasties; for the various king-lists are very confused and defective at this point, great monuments do not exist, and there are very few dated minor remains. Consequently, the number and the sequence of kings and even the relative order of the dynasties is uncertain. Recent research, again, has not lessened the numerous difficulties by proving that several of the kings formerly assigned on insufficient evidence to the Ninth and Tenth Dynasties are unquestionably subsequent to the Twelfth. The most valuable information for purposes of history is that derived from the biographical inscriptions of three great nobles of Assiut, viz. Khety 1st, Tefaba, and Khety 2nd, who lived under the Ninth and Tenth Dynasties. The incomplete picture which they furnish harmonizes with the little that can be gathered from other sources, and makes it possible to form at least an approximate idea of the conditions which obtained. The three centuries and a half which intervene between the end of the Sixth and the beginning of the Eleventh Dynasty may then be regarded as a time of political disorganization and decay, when the strong unified government of Pepi I had broken down, and there was no single individual who had the power effectively to assert his supremacy over the crowd of local princes. A version of Manetho, which records that the Seventh Dynasty was composed of seventy kings who reigned, in all, seventy days, may perhaps depict not wholly inaccurately the anarchy which prevailed. The great feudal lords in the provinces asserted themselves as independent sovereigns, and even waged war with one another or against the king. Khety 1st expressly states that he was appointed to the governorship of Assiut because he was a just man and had engaged in no rebellion. His successor Tefaba victoriously supported the legitimate dynasty of Herakleopolis against the princes of Thebes who headed an insurrection of all the southern districts; and Tefaba's son, Khety 2nd, not only defeated the rebels of the south, but actually replaced King Ka-mery-ra upon the throne from which his own citizens of Herakleopolis had removed him. These records show how the power of the king had dwindled from what it was in the days of the masterful Pepi I. The common people were downtrodden and miserable, and a story of the time narrates how the poor farmer was oppressed by hectoring stewards in the absence of his master. It is scarcely surprising to find that the arts languished and culture fell to the lowest level which it reaches in Egyptian history. The energy and the organization necessary for the carrying out of great enterprises were deflected into other channels; the craftsman and the sculptor had no wealthy patrons to encourage and to stimulate them.

The excavations at Denderah covered the whole of this period, as well as the two centuries of the Eleventh Dynasty when the Mentu-hoteps finally asserted the supremacy

of Thebes over the northern provinces, and the country began to revive under the salutary influence of an organized régime. The earliest tombs discovered on the site were two or three large mastabas of the Fourth Dynasty, from which there are no skulls or skeletons. Next in date come the mastabas of several wealthy persons of the Sixth Dynasty and some pit-tombs which are contemporary with them. From these were obtained only seven specimens (detailed in the Appendix), one of which, however, is the skull of Ana, wife of Adu 2nd. This Adu was a great noble, one of the princes of Denderah and son of Adu 1st, who was director of the pyramid-temples of Pepi I and Pepi II; a portrait statue of him was found in his tomb. The remainder of the series come from what are described in *Denderah* (pp. 13-22) as 'undated tombs of the Seventh to Eleventh Dynasties.' It is therefore a uniform mass of material, of which the archaeological accessories are homogeneous in character, and can be placed as a whole within the wide bounds here assigned, though it does not admit of more precise subdivision. The limits of date are given by the inscriptions of the Sixth Dynasty princes Mena and Adu, who are mentioned as living under Pepi II; and by a cartouche of the Eleventh Dynasty king Mentu-hotep. In all the inscriptions which were found on the site (excluding of course those of the Ptolemaic and Roman time) there was no mention of any name earlier or later than these, so that the range of time is strictly defined. The archaeological remains confirm the evidence of the inscriptions; nothing was found of which the intrinsic character suggested an earlier or later time¹, but, on the contrary, the types were clearly transitional between these two fixed points. Only a small number of graves would have been classed, had they occurred independently, as belonging to the Twelfth Dynasty; and they may well be regarded as belonging to the advanced Eleventh Dynasty, when, as has been stated above, the princes of Thebes began to gain the ascendancy and to inaugurate that government which attained its full splendour under the houses of Useratesen and Amenemhat.

From the beginning of the Sixth to the beginning of the Twelfth Dynasty (3500 B. C. to 2780 B. C.).

The Seventh to Eleventh Dynasty tombs may be treated under two headings, viz. mastabas and plain pits. The mastabas are oblong brick buildings, of which the normal type may be described as follows. On the eastern face, enclosed by a brick wall which is sometimes pierced by a door but is often solid, there is a narrow corridor running the whole length of the building. From this a doorway leads into an oblong chapel intended for offerings to the dead, which runs parallel to the corridor, beginning at its south end, but commonly does not extend for more than a third or a half of the length of the building: the remaining length (i.e. half or two-thirds) behind the corridor is sometimes partitioned into chambers, but is more often filled in with gravel or solid brick. North-west of this is sunk a pit, down which the body was lowered; and at the bottom of the pit a turn to the south leads into the actual place of sepulture, which is always so planned as to come exactly behind the chapel where the offerings were made. The details and dimensions vary; the larger mastabas have such accessories as staircases and courts, with tunnelled entrances to the pit; while, on the other hand, some builders dispense with a separate chapel for the offerings and make the actual corridor serve its purpose. In the west wall of the chapel is placed a dummy door of panelled stone, through which the Ka or double of the deceased would pass when it came up from the tomb to partake of the refreshment offered it. For utilitarian purposes one door for each person buried in the mastaba might seem sufficient, but an architectural motive was suggested by its use and so an entire row of 'false doors' was placed along the west wall of the

¹ Save only some half a dozen sporadic or secondary burials, all subsequent to the Twenty-fifth Dynasty and of unmistakable character, from which no specimens are included.

From the
beginning of
the Sixth to
the begin-
ning of the
Twelfth
Dynasty
(3500 B. C. to
2780 B. C.).

corridor; in the finest tombs of the Sixth Dynasty indeed a complete façade of this kind is formed outside the east front. The space above ground covering the pit and the sepulchre is enclosed by a brick wall; and the interval between this wall and the chapel and corridor is filled in with gravel, or more rarely with brick, so as to weld the whole structure into a single block.

Such were the tombs of nobles, wealthy men, and officials; but the very great majority of persons with whom we are dealing in our series were not nobles or wealthy people but plain *bourgeoisie*, as may be supposed from the style of their burial. The tombs of such people had no building above the ground; a plain oblong pit, sunk to a depth of some twelve to sixteen feet, gave entrance to a small chamber three or four feet high, cut into the rock at right angles to the pit and closed by a little wall of piled bricks. Here lay the skeleton (not mummified nor in any way preserved) at full length, with its sparse tomb-furniture beside it. They were not paupers who were buried in this fashion, since their relatives could afford to place pottery and objects with them; but the latter were not rich enough to indulge in any sort of elaborate display, and only very rarely placed in the well just outside the chamber a simple stele inscribed with the name.

The debasement of this period as revealed by the excavations at Denderah has been sufficiently indicated. In conclusion, it may suffice to say that no articles of real value, except inscribed stones, and few objects even of interest except pottery, were found as representative of the Seventh to Tenth Dynasties. Such as they are, however, even these tell the same tale. Education had sunk so low that the art of engraving monuments was in danger of being forgotten, and it has been suggested that the barbarity of the signs upon the stelae is due to an effort to render into hieroglyphs suitable for carving the cursive hieratic of the scribes who wrote upon papyrus. A review of the pottery reveals an extraordinary paucity of types, mostly to be identified as very degenerate descendants of those in use in the Sixth Dynasty, and showing few resemblances to the products of the Twelfth. It is only with the Eleventh Dynasty that indications of improvement begin to appear in several directions.

*From the beginning of the Twelfth Dynasty to the end of the Fifteenth
(Twelfth Dynasty, 2780 B. C. to 2560 B. C.).*

The princes of Thebes, whose power had been gradually increasing under the almost nominal overlordship of the weak monarchs of Herakleopolis, definitely established their independence towards the close of the period which has been described in the preceding section. The accession of Amenemhat I, founder of the Twelfth Dynasty, marks the moment at which the supremacy of Thebes was universally recognized and a firm government was re-established from end to end of the country. Under the rule of vigorous and enterprising kings Egypt attained a prosperity unequalled in any preceding period of her history; and the organization of her internal resources kept pace with a considerable extension of her foreign dominion. One of the first acts of the enlightened monarch who initiated the new régime was to establish an orderly administration of his provinces. In the biography of Khnemu-hotep, a governor of the Oryx nome, who like others of his family was buried in a splendid rock-tomb at Beni Hasan, it may be read how Amenemhat I 'came and restored that which had been overthrown and gave back what one city had taken from another'; how he marked out the frontiers and set up the boundaries, and enforced the ancient laws that regulated the irrigation. His

successors were not backward in continuing the policy of restoration and development. Usertesen III reopened the great canal made in the time of the Sixth Dynasty, which enabled boats voyaging to Nubia to pass the First Cataract in safety; and by his regulation of Lake Moeris, Amenemhat III permanently altered the aspect of a whole province, and greatly enlarged the cultivable area of Lower Egypt.

From the beginning of the Twelfth Dynasty to the end of the Fifteenth (Twelfth Dynasty, 2780 B. C. to 2560 B. C.).

Building was carried out upon a vast scale. To Amenemhat III was due the erection of that huge temple at Hawara, which under the name of the Labyrinth so powerfully impressed the imagination of classical writers; and the magnificent edifices which have made Karnak a wonder of the world were begun by these splendid lords of Thebes. From Tanis and Bubastis in the Delta to Semneh and Kummeh at the Second Cataract the remains of temples, obelisks, and statues testify alike to their activity and to the resources which they could command. No king since the Sixth Dynasty had been wealthy or powerful enough to accomplish that which was the dearest wish of every Egyptian, by the erection of a tomb which should be a perpetual monument; but now at Illahun, Hawara, and Dahshur pyramids were erected, which, although less massive, are conspicuous even beside the gigantic piles of Gizeh.

The great nobles were worthy servants of such masters, loyally fulfilling their duties in the great feudal system of which they formed a part. A vivid idea of their activity is given by the paintings in the tombs of Beni Hasan, where we may see the princes of the Oryx nome inspecting the produce of the farms, superintending the gathering of taxes, and receiving the tribute brought by foreigners for the king; while scenes of hunting and fishing in the marshes show how they passed their hours of relaxation. The tombs of such men as these, deep-hewn in the desert cliffs high up above the cemeteries of the poorer people, impress the mind with the importance of their owners. The entrance will be through a sculptured façade sometimes sheltered by a columned portico. This leads into a spacious hall, the roof of which is supported by several fluted columns, while its walls are decorated with varied scenes in gorgeous colours. A deep pit sunk in the floor, and then filled in, contains the sepulchre of the mummy; and at the end of the hall facing the entrance is a small chamber hewn in the native rock as a shrine for the statue of the prince, who sits majestically enthroned with his wife beside him.

The newly awakened energies thus exhibited in public and private works found another natural and indeed inevitable outlet in military enterprises. It was in all periods one of the first duties which confronted a strong ruler of Egypt to repel the encroachments of the several races which incessantly threatened the borders alike from the south, the east, and the west. A campaign or at least a *razzia* against the Aamu and their kinsmen of Sinai, the Nubians, and the Libyans, was as regular an occurrence as our own Indian frontier wars. It was originally the necessity of self-defence that dictated such expeditions; but the advantages of commerce supplied a further motive, and the tribute exacted from the subject foreigners constituted a valuable addition to the royal treasury. Thus Amenemhat I, at the same time that he was establishing a settled administration at home, conducted successful wars against the northern Nubians and against the Asiatics. Usertesen I reduced the negroes to temporary vassalage as far south as the Second Cataract, and Usertesen III made the occupation of their country really effective by the erection of a series of forts in the neighbourhood of Wady Halfa.

The industrial progress of the country was such as might be expected under these renewed conditions of prosperity. Quarries which had long been deserted were again

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Fifteenth
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exploited to supply the enormous quantities of stone required for building and for statues; the turquoise mines in Sinai were reopened, Nubia sent her gold once more, and Punt her tribute of woods and spices. The sculptors found generous patronage, and must have been ceaselessly employed in equipping the temples and the tombs. A massive solidity characterizes their work in this epoch. It was a time when newfelt strength prompted to great undertakings; and it is significant of the spirit of the age that a private individual, Tehuti-hotep, quarried for his own likeness a monstrous block of alabaster over twenty feet in height and weighing some sixty tons. The kings were not outdone by their subjects; whole series of portrait-images of superhuman size were hewn of the hardest stone to furnish their various temples; and if it is impossible to accept Herodotus' description of the statues rising fifty fathoms above the waters of Lake Moeris, yet there can be no doubt that the kings of the Twelfth Dynasty evinced a new and peculiar fondness for adorning their buildings with towering colossi. It is hardly overstrained to say that this consciousness of mastery and strength is the dominant note throughout the work of the Middle Empire. The spontaneous grace and vivacity of an earlier time has been in a great measure lost; the delicate refinement born of exotic culture is still unknown; but in its massive power and conscious pride of life the Twelfth Dynasty is perhaps more typically Egyptian than any other before or after.

The painter was no less favoured than the sculptor, and found full scope for his talent in the brilliant decoration of princely tombs. It is no slight praise to say of the frescoes that they are but little inferior to those which were executed under the Old Kingdom.

Literature shared in the general revival and awakening of intellectual interests; and if historians and philologists derive much of their most precious material from the inscriptions and papyri of this period, this fact must be regarded, apart from the good fortune which has preserved such documents, as evidence that literary production was more general and more widely diffused in this age than in those which had preceded it.

The Twelfth Dynasty came tranquilly to an end under undistinguished monarchs and merged without noticeable disturbance in the Thirteenth. The new royal house was probably connected by ties of kinship with its predecessors and seems to have continued the same system and policy. Though our knowledge of this dynasty is very inexact and many details are wanting to complete its chronicle, yet a not inconsiderable number of records and monuments enables us to form a tolerably consistent idea of the march of events. Arrived at its zenith under the Twelfth Dynasty the prosperity of Egypt gradually declined under the Thirteenth. A series of insignificant Pharaohs replaced one another in quick succession, and only once or twice a man of unusual individuality emerged to restore for a brief period a shadow of the old magnificence. Finally the Thirteenth Dynasty succumbed of its own inherent weakness, and Egypt was again left masterless. With the fall of the Thirteenth Dynasty we have fully entered upon a period which is not less difficult and obscure than that which separates the Sixth Dynasty from the Twelfth. That notable events and changes took place there is indeed ample indication. History did not stand still as it would seem to have done in the dark ages between the Old and the Middle Empire; on the contrary, it was a time of great international movements, new developments of commerce, invasions and disruptions of empire. Little of what occurred can be clearly distinguished, and until almost the end of the Seventeenth Dynasty we are very much at the mercy of hazardous conjecture and theory. In part this is due to an unhappy accident which has rendered the king-list of the

Turin Papyrus unintelligible at this point, a loss which is irreparable inasmuch as the list of Abydos omits the entire period and that of Karnak is manifestly incomplete. The remains of Manetho therefore constitute the sole documentary material available for the reconstruction of the order and succession of the reigns; while monuments are rare and are sometimes of disputed ownership and identity. In Manetho's account the same phenomenon may be observed as during the previous dark period which followed the close of the Sixth Dynasty. A very large number of kings is recorded as reigning in the space of a very few centuries, and this may be taken, in conjunction with the dearth of inscriptions and monumental remains, as indicating that no central government existed, but that princes and nobles usurped the functions of royalty. Of the Fourteenth Dynasty hardly anything is known excepting that the seat of its government was placed at Xoïs in the Delta, a detail which has a certain interest as showing that Thebes had lost its ascendancy. A few scarabs and an inscribed dagger, which will be referred to later, are almost the only record of their existence that these ephemeral pretenders have left behind them.

From the beginning of the Twelfth Dynasty to the end of the Fifteenth (Twelfth Dynasty, 2780 B. C. to 2560 B. C.).

The Fifteenth Dynasty, however marks, an epoch of great interest and importance; for Egyptologists are agreed in assigning to it the domination of that enigmatic people, the Hyksos. Their history is buried in perplexities and doubts. Josephus has indeed bequeathed a circumstantial account of their rule in Egypt; but as the manifesto of a fervid patriot, who was only intent on unearthing evidence of the existence of his imaginary Jewish empire, this account has a strictly limited value. It is generally considered to give a trustworthy version of Manetho's original history only in so far as the main outlines are concerned. From it then may be learned that in the reign of a king who cannot be identified, but who must certainly be placed after the Thirteenth Dynasty and before the Seventeenth, a race from the east invaded the country and established themselves in the Delta where they built several cities and set up their government. They oppressed the country for 511 years, at the end of which time they were conquered by two successive kings whose names may be recognized as Aahmes and Thothmes, and were expelled from the country. The origin and affinities of the Hyksos have been the theme of endless controversy. Manetho thought that they were Phoenicians, but records the opinion of others that they were Arabs. Modern writers have variously identified them in turn with the Canaanites, the Elamites, the Hittites, the Accadians, the Scythians. Their name is generally admitted to be derived from the Egyptian word meaning 'chief of foreign lands' or 'chief of foreign people,' and it may be regarded as certain that they came from the east of Egypt. The best opinion is that their irruption into the Delta was the effect of those displacements of whole nations which are known from other sources to have occurred at this time in Syria, Asia Minor, and Mesopotamia. The Hyksos were undoubtedly powerful kings. Josephus, quoting Manetho, speaks of them as taxing Upper as well as Lower Egypt; and their records are found as far south as Gebelên. Their foreign connexions were extensive. The immigration of the Beni-Israel shows the intimacy of their relations with the peoples of the eastern frontier; and it cannot be a mere chance that the name of Khyan occurs not only on a granite lion at Bagdad, but also on an inscribed alabastron at Knossos in Crete. The latter, moreover, is no isolated discovery, for an Egyptian statue of the Middle Empire was found on the same site, and the art of the early Minoan palace is eloquent of Egyptian influence. There will be further occasion when describing the contents of the tombs to remark on the far-reaching character of this commerce with the Mediterranean and the Levant.

That so few records of the Hyksos remain is due to the vindictive hatred with

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which their successors destroyed their monuments and chiselled out their names. Traces of them, however, have been found in the vicinity of their great cities in the Delta. Thus a cartouche and inscription of Apepa I were discovered in the temple at Bubastis, and the name and titles of Apepa II had been inscribed on a Twelfth Dynasty statue in the temple of Tanis. At Bubastis also was found the lower part of a colossal statue of Khyan. Of minor remains there are extant a scribe's palette with the titles of Apepa I, a table of offerings dedicated by Apepa II to Set the favourite god of the Hyksos, and scarabs of Apepa I, Khyan, Ya-gebher and several other kings who most probably belonged to the same line.

The period of the Twelfth to the Eighteenth Dynasties is represented by specimens from two sites, viz. Hou and Abydos. The graves belonged not to princes like those who were buried in the cliffs of Beni-Hasan or under the mastabas round the pyramid of Dahshur, but to people of a rank and standing very similar to those of the Sixth to the Twelfth Dynasties whose skeletons were found at Denderah. Structurally the tombs are of two kinds. They are either small chambers opening out of a pit some twelve to fifteen feet deep, or they are shallow oblong trenches. The bodies were buried at full length without any sort of mummification. The trench-graves occurred only at Hou, where for the first time a series of objects was brought to light which could be definitely dated to the period between the Twelfth and Eighteenth Dynasties. It was from the evidence there obtained that it became possible to determine the exact chronological place of the pit-graves of Abydos. One result of this more exact knowledge has been to render it difficult to assign any of the specimens exclusively to the Twelfth Dynasty.

The excavations at Hou proved that Twelfth Dynasty traditions were carried on unbroken throughout the entire Hyksos period, and it is only with the full development of the Eighteenth Dynasty culture that a marked difference can be observed. So that while the trained eye of the archaeologist can indeed trace the shading of the Twelfth Dynasty into the Fourteenth, and can clearly distinguish the work of the Fourteenth Dynasty from that of the New Empire, yet it has been practically impossible to apply such minuteness of differentiation on an extensive scale. The whole of this series then must be considered as belonging to a period intermediate between the Middle and the New Empire; the upper limit being the latter part or perhaps the end of the Twelfth Dynasty, while the lower limit falls at some point, which cannot be more precisely fixed, later than the Fourteenth and appreciably earlier than the Eighteenth.

The evidence of dating may be epitomized as follows. In the cemetery at Hou scarabs were found of two Twelfth Dynasty kings, viz. Usertesen I and Amenemhat III, while there was nothing indicative of an earlier date either in inscriptions or tomb-furniture. This may be considered to fix the upper limit as not earlier than the Twelfth Dynasty, though it does not amount to quite conclusive proof of actual coincidence with the Twelfth Dynasty since fine scarabs were possibly treated as heirlooms. Twelfth Dynasty pottery was common, and other typical products of the same dynasty occurred, though less frequently. A certain amount of pottery was of regular Eighteenth Dynasty forms, and various other objects showed a close affinity with Eighteenth Dynasty style. The whole cemetery was quite homogeneous in character; and the Twelfth Dynasty types were found in combination with those of the Eighteenth, which excludes the hypothesis of a mere juxtaposition of Middle Empire and New Empire graves. The final and conclusive evidence was given by the inscription on a fine dagger, which was engraved with the cartouche of Suaz-en-Ra, who is known as a king of the Fourteenth or

one of the succeeding Dynasties. That scarabs of Ya-geb-her and Shesha were found is confirmatory of the dating assigned to the cemetery, for the place of these kings is now generally admitted to be between the Twelfth and Eighteenth Dynasties.

From the beginning of the Twelfth Dynasty to the end of the Fifteenth (Twelfth Dynasty, 2780 B.C. to 2560 B.C.).

The characteristics of this intermediate time having been established by the excavations at Hou, the tombs subsequently discovered at Abydos admitted of dating by the evidence of pottery and small objects. Nothing was brought to light which was inconsistent with the results obtained at Hou. One difficulty, however, presented itself which was absent on the latter site. As the digging of pits for a sepulchral chamber was costly and troublesome, the Middle Empire pits were often usurped by people of the Eighteenth Dynasty. Either the new burial was merely intruded beside the old one, or the original owner was entirely dispossessed. Consequently it was necessary to be very careful in discriminating, and the merits of every single case were examined and discussed on the spot. Not one specimen was accepted without a thoroughly satisfactory guarantee of date. There are further included in the measurements a few specimens (detailed in the Appendix) which came from a quite peculiar class of burials. These occurred at Hou and were named, not altogether happily, 'Pan-graves.' They were shallow holes, circular or oval, and not more than two feet in depth. The bodies were laid in a semi-contracted position or were disarticulated, and in one case the bones were wrapped in cloth and sheepskin, as was the custom in Predynastic times. The contents of the graves consisted partly of well-known Twelfth Dynasty vases, ring-stands, and beads, partly of such wholly peculiar objects as the painted frontlets of animals and bracelets made of slips of shell. With these were also bowls of an incised black ware and black-topped red pots, all of which were similarly unknown in contemporary Egyptian manufactures. The 'Pan-graves' therefore present a curious problem. Their date is fully established, but who and what were the people to whom they belonged? The pottery so closely resembles the Predynastic ware in technique as to have deceived more than one museum expert. Is it to be supposed that there was a sudden revival of the Predynastic art? and if so, to what cause must it be attributed? Until further examples are discovered it is difficult to make a definite pronouncement. Obviously the occurrence of a score of graves of a character hitherto unknown is insufficient ground on which to base a theory of invasion, and it is safest for the present to suppose that the 'Pan-grave' people were skilled potters who, if they were not natives, had been imported to supply a fashionable taste; much as in mediæval days Byzantine mosaicists went to Cordova or Italian painters visited the court of the Sultan.

From the contents of the tombs of the Twelfth and Fifteenth Dynasties we may obtain an idea of the tastes and the resources of their owners. The little stone vases two or three inches in length which were used for perfumes or for antimony, as well as the other accessories of the toilet, are made most commonly of alabaster, though serpentine and basalt are not unusual, and blue marble (the employment of which is peculiar to this period) was a very favourite material. The funnel shape is almost the only type which survives from the Sixth Dynasty, while globular and pear-shaped vases, spouted perfume dishes, and flat-bottomed kohl-pots with swelling sides, are new and characteristic.

Beads were in general use and were manufactured of blue or green glazed frit, of clay, carnelian and amethyst. Except for a few sporadic instances in the Archaic time, the use of amethyst is wholly peculiar to the Twelfth and immediately succeeding Dynasties. Some of the most beautiful glazed beads, fluted globes of as much as half an inch in diameter and of a rich blue colour, are also only known in this period.

From the beginning of the Twelfth Dynasty to the end of the Fifteenth (Twelfth Dynasty, 2780 B.C. to 2560 B.C.).

Scarabs, which like beads were essentially feminine ornaments, exhibit their highest perfection under the Twelfth Dynasty. They are sometimes of carnelian, jasper, or amethyst, but more often of glazed steatite, and are incised with that continuous scroll pattern which was quickly borrowed by Greek designers. The scarabs of the Fourteenth and Fifteenth Dynasties have somewhat degenerated; the discontinuous scroll or vertical lines of hieroglyphs and the somewhat barbarous forms of the signs differentiate them from the earlier examples.

Jewellery is only rarely found, as it has generally become the booty of the skilled tomb-robbers of the New Empire. The little which has been obtained from these middle-class burials is artistic and well made. But the consummate skill of the Middle Empire goldsmiths can only be fully appreciated from the jewellery of the royal princesses whose tombs were discovered beside the pyramids of Dahshur. Their magnificent diadems, necklaces, bracelets, pectorals and anklets are now amongst the most admired treasures of the Cairo museum. The cloisonné work of lapis lazuli, carnelian, and other precious stones set in gold is extraordinarily gorgeous, and of a fineness which might challenge modern Geneva.

The ladies used mirrors of burnished copper, the handles of which were often carved in ivory. Of ivory also were made bracelets, wands, and inlaid boxes. The men were equipped with axes, daggers, knives, and other tools made of copper; for bronze, though apparently found at Dahshur, was certainly not in common use before the Eighteenth Dynasty. The Twelfth Dynasty was synchronous with a revival of ceramic art. The common red pottery which is made in almost all periods assumes a great variety of forms, only a few of which recall the degraded tradition of the preceding period. A buff-coloured ware, the use of which continues into the New Empire, now makes its first appearance, and there is another anticipation of the Eighteenth Dynasty in certain brilliantly-burnished red haematitic vases, which are very possibly of Syrian origin. Several other classes of pottery are found which were certainly not of native manufacture. Thus the thin black-topped haematitic vessels introduced by the 'Pan Tomb' people continued in use till the New Empire. A black ware of the bucchero kind incised with patterns in white is certainly a foreign importation. It is common in Cyprus and, like the incised black pottery of the Archaic periods with which it has evident affinities, probably originated on the European side of the Mediterranean. Yet another kind of foreign pottery must be noted, which has not yet been found in any graves, but which occurred in the Twelfth Dynasty settlement at Kahun; namely, the beautiful polychrome ware which has since been found in Crete and in Thera, and is now recognized as a characteristic product of pre-Mycenaean Greece.

Lastly, the art of glazing was now extended to pottery, and the Twelfth Dynasty marks the beginning of the fine period of 'Fayence.' The glazed vases and dishes of this time are of a rich blue colour and are often ornamented with patterns in black; the employment of polychrome appears to be rare before the Eighteenth Dynasty.

The Eighteenth Dynasty (1590 B.C. to 1330 B.C.).

The history of the Eighteenth Dynasty is minutely dealt with in many works which are accessible to every reader. The 'New Empire,' which begins with the expulsion of the Hyksos by Aahmes the founder of the Dynasty, has left innumerable records in monuments, inscriptions, and works of art. For the earlier Egyptologists it may

almost be said that history only began at this point, as indeed it still begins here for many persons who merely take a general interest in the subject. So much attention, consequently, has always been devoted to these reigns, and the main episodes are so familiar, that a brief outline will suffice for the present purpose.

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(1590 B.C.
to 1330 B.C.).

The Eighteenth Dynasty then is the Elizabethan age, the time of expansion and foreign conquest, the time of world-interests and cosmopolitan culture. Under the two kings indeed, who were the first to rule over liberated and reunited Egypt, the energies of the country were mainly absorbed in the process of recovery and reorganization. Though the usual expeditions against the frontier tribes were executed with the usual success, yet Aahmes and Amenhotep I showed themselves no more covetous of foreign conquests than their ancestors had been, and devoted their thoughts mainly to the erection and the adornment of their capital at Thebes. But a new era was inaugurated by Thothmes I, the third king of the line, when he broke through the secular traditions of Pharaonic policy by leading an army of invasion into Asia. Hitherto the territorial expansion of Egypt had been confined to the Nile valley, and to such proximate districts as the Oases on the one side, and the Sinaitic peninsula on the other. There had no doubt been close and frequent intercourse with Syria, especially since the days of the Twelfth Dynasty; and caravans passing to and fro had exchanged the products of Asia with those of Africa. But the conception of Asiatic conquest was wholly new, and should doubtless be regarded as the immediate outcome of the impression made by the Hyksos invasion. It was the conviction that he could never rest secure until the menace from the east was removed which drove Thothmes I to overrun Syria from end to end till he hardly stayed his march at the very banks of the Euphrates.

Had all his successors been cast in the mould of Queen Hatshepshut, who occupied the years of her rule in restoring ruins and building temples, the expedition of Thothmes I would have had no lasting results. But in Thothmes III there arose a man of vast ambition, who launched Egypt on that new course which was to carry her out of her traditional isolation into the turmoil of world-history. Hardly had the death of Hatshepshut freed him from the shackles of a co-regency than he started on the first of those Syrian campaigns which were continued year after year until his death; and he ultimately bequeathed to Amenhotep II a dominion that extended from Abyssinia to Cilicia. This was the greatest expansion which the empire ever attained, nor did its boundaries remain so wide for more than a few years. After the death of Amenhotep III began a rapid decline, which may be traced step by step in the correspondence of the provincial governors preserved on the clay tablets of the archives of Tell-el-Amarna.

But if the tenure of these new provinces was brief, their temporary acquisition was fraught with momentous consequences for Egypt. Now, for the first time since documentary records begin, she was brought into direct relation with the great Asiatic powers. It chanced that the moment was exceptionally propitious; for Babylonia was stagnating under a weak Kassite Dynasty, Assyria had only lately emerged from obscurity, and the Hittites were as yet but preparing to descend from their homes in the mountains of Amanos and Taurus. The several rivals therefore who confronted the first conquering Pharaohs did not immediately threaten their fresh-won laurels; but if they were too weak to venture on attack they were yet too formidable to be lightly challenged. Each side feared the other and willingly compromised by alliances and treaties. The rulers of Babylon and Assyria, the princes of the Hittites and even those

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of the weaker Matiene, wedded their daughters to the Egyptian king, who duly accorded them the royal rank to which they were entitled in their own country. Between the several courts proceeded a constant interchange of embassies, and the varied riches supplied by Asia were incessantly bartered for the gold of Nubia.

Such were the relations maintained with the great neighbouring powers in the prosperous days before the apathy of Amenhotep IV and his successors had sacrificed all outlying dependencies to Hittite encroachment. But the position of the vassal states was very different. They existed merely to be exploited, and Syria became for Egypt what the Indies were for Spain, an El Dorado to be ruthlessly pillaged by its fortunate possessor. The princelings of Kharou and Phoenicia were forced to send their sons to Thebes, where they were Egyptianized and converted into tools of the oppressor; their daughters became mere inmates of Pharaoh's harem, and the very administration of their government was watched by resident officers. These subject provinces in turn were separated from the powerful independent kingdoms by a frontier region bounded on the south by the Amorite country. Here Egypt exercised only an indefinite suzerainty, which varied in effectiveness according to the energy or the indolence of the temporary occupant of the throne.

The effect of this extension of her political horizon was enormously to increase the wealth and material prosperity of Egypt by putting her in immediate possession of great centres of trade and industry, as well as by affording her access to the most important arteries of commerce. The tribute of Kharou and Phoenicia flooded the royal treasury and overflowed into the coffers of the priests of Amon. Nor was the growth of luxury confined to the court or even to the houses of the great nobles. To every soldier was allowed his share of the plunder obtained on the Asiatic campaigns, and the new influences penetrating all classes of society leavened the whole life of the people. From the fresh-won provinces came countless products unknown to an earlier generation, costly woods and perfumes, dyed and embroidered fabrics, jewellery and precious stones, wines and olive oil. Strange and new animals were imported, foreign breeds of cattle, exotic trees and plants. The horse was naturalized, and the use of chariots transformed the old organization of the army. Above all, the secrets were revealed of fresh arts and industries which were transplanted into Egypt and flourished there under the care of foreign craftsmen.

The Syrians, for instance, were cunning workers in metal. Weapons and armour and vessels of gold and silver were among the choicest articles which they brought as tribute; and to their workshops may be traced much of the fine bronze work which is found in tombs of the period. The beautiful glasswork of Phoenicia occurs as early as the reign of Thothmes III; and not only the style and the decoration, but even the fabric of much of the pottery is probably Syrian. Yet the conquered states were not the only source from which new riches were derived. The Hittites and the Babylonians, masters of the great trade-routes of Asia, were careful to conciliate their dangerous neighbour with lavish gifts; whilst 'the islands of the Mediterranean' (mentioned by Thothmes III as his tributaries) maintained a sea-borne commerce with Egypt which brought her into immediate contact with the rising civilization of Greece. Egyptian traditions permeated the art of Mycenae, and the frequent occurrence of Mycenaean vases in tombs of the Eighteenth Dynasty shows that there was a certain reciprocity in these relations. Finally, the intercourse with Cyprus, which must have begun in very early times, now assumed a most intimate character, as is proved by the evidence of metal-work

and ceramics, even apart from the probable identification of the island with the often mentioned 'Alashiya' of the texts.

Of the temples and buildings which were raised through the length and breadth of the country many have perished or have been overlaid with the restorations of a later date. The ruins of the town built by Akhen-Aten, the heretic sun-worshipper, at Tell-el-Amarna, mirror the renascent intellectual vigour and the fresh artistic impulse of his reign; but it is to Thebes that we must look for the most complete memorial of the splendour of the Eighteenth Dynasty. There the temples of Karnak, of Luxor, and of Deir-el-Bahri witness to the genius of the architect; and the frescoed tombs tell a thousand tales of the daily life of country-house and court.

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Of the Eighteenth Dynasty we have a number of specimens from each of two sites. One of these is a locality between Hou and Denderah, which to avoid confusion is referred to by the name of Shekh Ali, though it is actually several miles to the south of that village. The specimens from this place were all obtained from a single pit in which human and animal bones were heaped pell-mell. The only objects found with them were a small plaque and blue glass ear-ring of the Eighteenth Dynasty and some pottery of the same period; but these have been considered sufficient to indicate the age of the deposit. It is difficult to explain why a number of bodies were thus flung together in an Eighteenth Dynasty tomb-pit. Possibly a sudden pestilence or some other disaster may have been the cause of their hasty and unceremonious interment. In any case there can be no doubt that the Shekh Ali series must be regarded as representative of a single period, and of a class presumably inferior to any which has hitherto been noticed in these pages.

The other site which has provided a series of skulls is Abydos, where numerous middle-class burials were found in such pit-tombs as have previously been described. The specimens are closely dated by archaeological evidence which was carefully investigated on the spot. The majority belong actually to the Eighteenth or the beginning of the Nineteenth Dynasty, but in a certain number of cases the re-use of a tomb in a rather later period makes the dating of a specimen inexact to within the limits of a few Dynasties. None, however, are as late as the Twenty-sixth Dynasty; so that the entire number may be grouped between the Eighteenth and Twenty-sixth, and may further be considered to represent almost exclusively the earlier of these Dynasties (see Appendix, p. 121).

THE PTOLEMAIC AND ROMAN PERIODS (from 331 B.C. onwards).

The ten centuries which separate the Nineteenth Dynasty, when independent Egypt was at the zenith of her prosperity, from the Ptolemaic period, when a line of alien sovereigns restored for a short time her long vanished splendour, are virtually unrepresented in this collection. Though a small series of specimens may be assigned to about the Thirtieth Dynasty, when some sturdy patriots succeeded for a few years in shaking off the Persian yoke, we are not otherwise reminded of the dismal chronicle of that decline which began under the Ramessids and continued down to the last quarter of the fourth century before Christ.

At the moment when his victories over Darius put the Persian Empire at the feet of Alexander the Great, Egypt, like the other provinces of that Empire, was under the

The Ptolemaic and Roman Periods (from 331 B.C. onwards).

administration of a satrap, who submitted without resistance on the approach of the Macedonian army. Alexander was welcomed by the natives, whom he knew how to treat with gentleness and consideration, was crowned king, and assumed all the sounding titles appropriate to a son of Ra (331 B.C.). During the few months that he passed among them he accustomed the Egyptians to the change of masters; and on his death (323 B.C.) the government passed without disturbance into the hands of Ptolemy, one of his most distinguished generals. After a few years Ptolemy, who had at first ruled in the name of the Macedonian kings, assumed the royal titles for himself, and thus founded a Dynasty which lasted until the Roman conquest. With the personal and family relations of Ptolemy Soter and his successors it is unnecessary to deal; for the present purpose it is sufficient to understand how Egypt under their rule developed fresh vitality and acquired a new importance in the history of the world, though at the expense of a partial sacrifice of nationalism. To estimate the political position it is necessary to realize how widely the centres of culture and interest had been displaced since the period which was considered in the last section. In the course of the thousand years which had elapsed the ancient Oriental empires had fallen one by one. Babylonians, Assyrians, Hittites had disappeared from the stage of history, to be replaced by the Persians, whose power in turn had just been shattered by Alexander. The islands and cities of Greece in the meanwhile had evolved their incomparable civilization, which was already dying down when the Macedonians took up the torch of Hellenism to carry it to the east. In the western half of the Mediterranean the lately founded colonies of Magna Graecia had now attained a high position, and Syracuse was aspiring to the hegemony of Sicily and Lower Italy. Rome was conquering her neighbours in the peninsula one by one, and unifying the heterogeneous elements of her growing dominion. In North Africa Cyrene was wealthy and prosperous, and Phoenician Carthage was consolidating a formidable commercial state.

On the death of Alexander his loosely welded eastern empire resolved itself into several minor kingdoms, of which Egypt was only one, and to the first view hardly the most important. In Greece itself the kingdom of Macedon retained its own proper territory and a certain suzerainty over many cities and states outside it; but Athens, Sparta, and Aetolia were independent and influential factors. Lastly, the various Aegean islands possessed the nucleus of a confederacy and Rhodes was a first-rate naval power. Thus, as a result of the westerly trend of colonization on the one side and the dismemberment of Persia on the other, the Mediterranean towards the end of the fourth century B.C. was encircled by a number of rival states expectantly awaiting a struggle the issue of which it was impossible to forecast. The first Ptolemies, by astute diplomacy and seasonable campaigns, gained a brilliant place among these various competitors, which was successfully maintained for more than a century. Cyprus and Cyrene were permanently annexed to their dominions; Palestine and Phoenicia were conquered; and in alliance with Rhodes and the islands the Egyptian fleet controlled the Aegean. To the far-sighted policy of Ptolemy II must be attributed the beginning of a friendship with Rome which continued unbroken till the close of the Dynasty. Commerce was fostered, the trade-routes to the Red Sea were reopened, and Egyptian ships sailed not only to Africa and Arabia, but even it is said as far as India.

Under the fifth and sixth Ptolemies, however, there began a decline from which the country never recovered. Palestine and Phoenicia were lost. Nubia, now completely independent, perpetually menaced the Thebaid; and the weakness of the central govern-

ment tempted the ambition of the kings of Macedon and Syria. The traditional friendship with Rome saved the later Ptolemies from the rapacity of the other Hellenistic sovereigns, but nothing could restore their waning fortunes. As the Romans extended their irresistible dominion Egypt fell more and more under their influence; and from the time when Ptolemy VII appealed to the Senate to restore him to the throne it may be said that his country only retained its independence through the forbearance of its too powerful protector. It was not, however, until the Ptolemaic Dynasty became extinct by the deaths of Cleopatra and Caesarion (30 B.C.) that Egypt became a Roman province. Of the internal organization of the country under the Ptolemies it is premature to write until the mass of papyri and other material bearing upon the subject has been edited. It seems, however, that Egypt prospered in their days; and if the riches of a Ptolemy were a proverb among contemporaries, it does not necessarily follow that they were wrung by extortion from the fellahin, who were probably at least as well treated as they had been under their native kings. The administration was in the hands partly of foreign officials, partly of natives; and there is considerable evidence to show that the races lived on terms of friendship and mutual toleration. Documents were commonly drawn up in both languages; and though the highest posts in the government were generally assigned to Greeks, yet a native Egyptian occupied an influential place at the court of Ptolemy VII, and another was viceroy of Cyrene, while a mere chance has preserved the information that an Egyptian was governor of the Thebaid under Ptolemy X. An inscription records the name of many Greeks as well as natives amongst the worshippers of the old gods of the Cataract; and the foundation of the Serapeum is only the most striking example of the not uncommon fusion of religious cults.

The Ptolemaic and Roman Periods (from 331 B.C. onwards).

Alexandria, with its famous museum and library, naturally became the focus of all literary and intellectual activity, but numerous other Greek cities were founded in various parts of the country. It is important, moreover, to observe that the influx of foreigners was not confined to the Greek element. Caesar describes the cosmopolitan character of the Alexandrian mob when he visited the city; and it is known that the standing army was composed of mercenaries of every race—Libyans, Thracians, Celts, and others. Besides all these, great numbers of emigrant Jews had settled in Alexandria, and some had even established themselves in the Fayyum. Ptolemy III again deliberately brought back captives from his Asiatic campaign to cultivate the crown lands; and it seems that a certain number of Persians lived in the Thebaid. It would therefore be far from surprising if the craniological series were to show some trace of the influence of various non-indigenous race-stocks.

Native art had sunk to a very low ebb after its temporary renaissance under the Twenty-sixth Dynasty. The best products are of foreign origin; a hybrid of Greek and Egyptian sculpture failed to obtain any considerable vogue, and the work of the Ptolemaic period in Egypt is, generally speaking, of the most debased character. A single exception must be made in favour of architecture, for it is impossible to disparage the temples of Philae, Karnak, Kom Ombo, Denderah, and Edfu. Even here, however, the slovenliness and incompetence of the sculptor is only rendered the more apparent by contrast; and the reliefs on the walls of these magnificent buildings are a pitiful travesty of those which were executed in the old days.

The skulls, of which measurements are given in this volume, were obtained in the excavations at Denderah (the 'Tentyra' of Graeco-Roman times). It may be remarked in passing that they are the only series (except that of the Thirtieth Dynasty) which had

The Ptolemaic and Roman Periods (from 331 B.C. onwards).

been submitted to mummification, a rite which was much rarer on the whole than the ordinary reader is accustomed to suppose. The mummification was rough and coarse, and none of the individuals can have been of high rank or considerable wealth; one is described in his epitaph as a 'goldworker,' another as a 'hunter,' and others again as 'stewards' or sons of stewards. No doubt they occupied very much the same social position as the people who were buried at Denderah in the old days of the Sixth to Twelfth Dynasties. The tombs were chambers some five or six feet below the ground, which were entered by a small stairway. Rows of mummies were stacked inside, often as

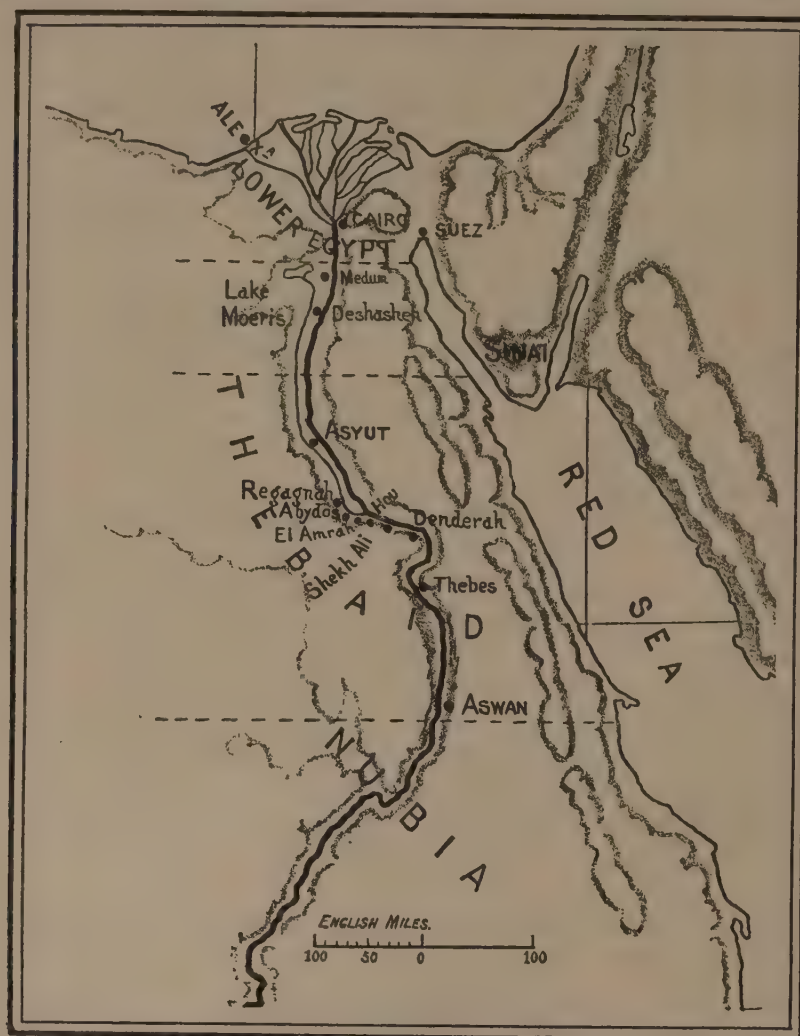


Fig. 1. Map showing sites mentioned in this chapter.

many as a dozen and sometimes more. There was very little tomb-furniture, and the only personal ornaments were amulets of blue glazed pottery and beads of the same material. Slabs of sandstone bearing inscriptions and roughly sculptured with offerings were often placed in the tomb; and stone or wooden labels were sometimes attached to the neck of the mummy. The inscriptions were almost all in Demotic, which shows that though their blood may have been mixed the native element predominated in the ordinary

life of the Tentyrites; and the names, so far as they have been preserved, are with one or two exceptions quite Egyptian in form.

The Ptolemaic and Roman Periods (from 331 B.C. onwards).

From the same site there were obtained numerous specimens of the Roman period. The discoveries of various antiquities and of three hoards of coins show that Roman influence continued at Tentyra down to at least the reign of Valentinian III (455 A.D.). It was a garrison town, as is shown by a record of the year 302 A.D., and must always have been a place of some importance. The figures of Roman Emperors, Caligula, Nero, and Trajan, are sculptured on the walls of the temple, accompanied by all the attributes and titles of Egyptian kings. For the archaeologist, however, the history of Egypt ends with the Ptolemies. The graves of the Roman time at Denderah contained no tomb-furniture, and other sites have yielded few objects of artistic value¹. Standards of taste sunk lower and lower until at last the moribund art of ancient Egypt expired as Coptic barbarism.

For the historian there is a new interest in tracing the fate of the Roman province and in studying the details of a government which has left indelible marks on the organization of the country. Such subjects, however, belong properly to other branches of knowledge than those with which this volume is concerned. On its absorption into the Roman Empire Egypt loses its unique interest at the same time as its independence; and the transference of allegiance from Rome to Byzantium (364 A.D.) precedes by less than three centuries the Arab conquest and the beginnings of mediaeval history.

¹ The encaustic mummy-portraits of Hawara, and the finely-modelled stucco head from Hou, are quite exceptional.

CHAPTER II

THE VARIOUS MEASUREMENTS EMPLOYED AND THE METHOD OF MAKING THEM

THE selection of the various measurements employed in cataloguing the present series of crania has been to some extent determined by the force of circumstances. Of the 1,500 odd specimens embodied in the present report only some 200 are now accessible. The majority of the skulls were measured on the site of excavation. Under these conditions it was hopeless to expect so detailed a mensuration as might be executed in a laboratory; it became important therefore to reduce the number of measurements to such a minimum as would provide the data for general comparisons only. In this respect perhaps there is matter for congratulation, since inquiries of this sort have been frequently overloaded with endless columns of figures, ample evidence, no doubt, of the diligence and application of the observer, but of questionable value, since up to the present they have led to no useful or satisfactory results.

Absolute
measure-
ments.

The absolute measurements recorded in the Appendix (see inset, pp. 1-32) include the following expressed in millimetres:—

1. Glabello-occipital length.
2. Ophryo-occipital length.
3. Basi-bregmatic height.
4. Maximum breadth.
5. Biauricular breadth.
6. Bizygomatic breadth.
7. Basi-nasal length.
8. Basi-alveolar length.
9. Nasi-alveolar height.
10. Nasal height.
11. Nasal width.

Little need be said regarding the method of taking these measures. The ophryo-occipital length was included with the intention of being able to estimate to some extent the superciliary projection; but we are alive to the difficulty of locating such a point as the ophryon, and we question very much the practical value of this diameter. The idea that it marks more precisely the boundary between the regions of the face and vault is in our opinion untenable, since the superciliary projection depends not so much on structural differences in the architecture of the face as on the imperfect expansion of the cranial cavity¹.

Little or no attempt has been made in the present inquiry to correlate the glabello-occipital and ophryo-occipital lengths, but since both were taken, both have been given in the catalogue published in the Appendix. The other measures are so universally recognized that no remarks need be made concerning them, other than to point out that the data supplied furnish us with the material for broadly estimating by means of the resulting indices the relative proportions of the calvaria and face.

¹ See *Journal of the Anthropological Institute*, vol. xxxiii, 1903, pp. 135-166.

From the absolutes given, the cephalic, vertical, upper facial, nasal, and gnathic indices have been computed. These are not recorded in the catalogue referred to, except in the case of the gnathic index, to which reference will be presently made, but may be ascertained by reference to the frequency-curves printed as separate sheets in the Supplement. There, in each series, the reader will be able to ascertain the index of any given skull, by searching for its catalogue-number within the frequency-curve of the given period, where the skulls will be found arranged in numerical order over the indices to which they correspond.

In regard to prognathism, we were early led to a consideration of the necessity of orienting the skull in such a way as to enable us to compare with fair accuracy the relative projection of the face in different specimens.

The orientation of the skull is no easy matter. As Professor Cleland said some thirty years ago, 'It is quite likely that it will always be impossible to determine from the characters of the skull what was its precise position in the erect position of the body.' Up to the present the problem remains unsolved, and though many suggestions have been made, yet all seem open to objections of a more or less serious nature.

The Frankfort-Munich plane, that most commonly adopted by modern craniometrists, whilst convenient to use for the rough comparison of crania, is open to serious objection if employed in association with other cranial measurements and projections; both the position of the external auditory meatus and the inferior orbital margin are liable to very considerable variations, the former by a

flattening of the cranial base, the latter by its ascent or descent according as the orbital index varies from microsome to megasome, for from a series of observations which have been undertaken¹ it appears that the lower orbital margin is liable to alter its position much more than the superior orbital border. In a series of thirty-eight skulls, which were selected on account of their variety of orbital forms, it appeared that there was a difference of as much as 13 mm. in the level of the lower orbital margin. It will be easily understood how such an alteration in the position of the inferior border leads to very grave alterations in the orientation of the skull: the accompanying diagram will at once serve to make this point clear. Another objection to the Frankfort-Munich plane, which in practice is found to be somewhat serious, is the fact that the points selected are not points from which any of the other measurements of the skull are taken (the transverse arc alone excepted); hence the line is of little or no use as a base on which to reconstruct the skull from the data usually given. Moreover, the fact that the plane is made to pass through points which lie lateral to the mesial plane is another disadvantage, as it prevents the orientation of profile outlines of the skull either from mesial sections or orthographic tracings. It is with the object of overcoming these difficulties that we have sought for some more satisfactory method of orienting the skull. The highly suggestive paper of Huxley² seems to us to embody methods which have a morphological significance and are therefore of much greater value than the arbitrarily selected

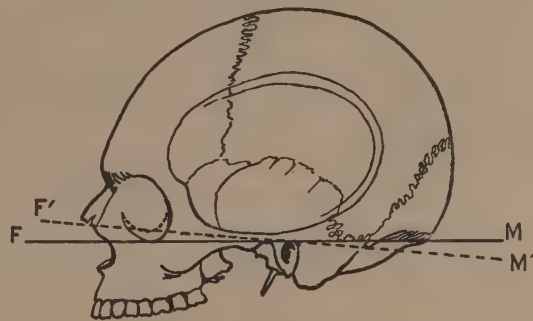


Fig. 2.

Orientation of the skull to obtain a true estimate of the projection of the face.

¹ See Appendix, p. 124.

² *Journal of Anatomy and Physiology*, 1867.

Orientation of the skull to obtain a true estimate of the projection of the face.

points which approach either the assumed vertical or horizontal. Unfortunately the adoption of Huxley's system involves making a mesial section of the skull, and though in many instances there may be no objection to such procedure, yet it must be borne in mind that oftentimes, when dealing with skulls of great age, it is difficult enough to preserve the crumbling remains intact without proceeding to apply the saw.

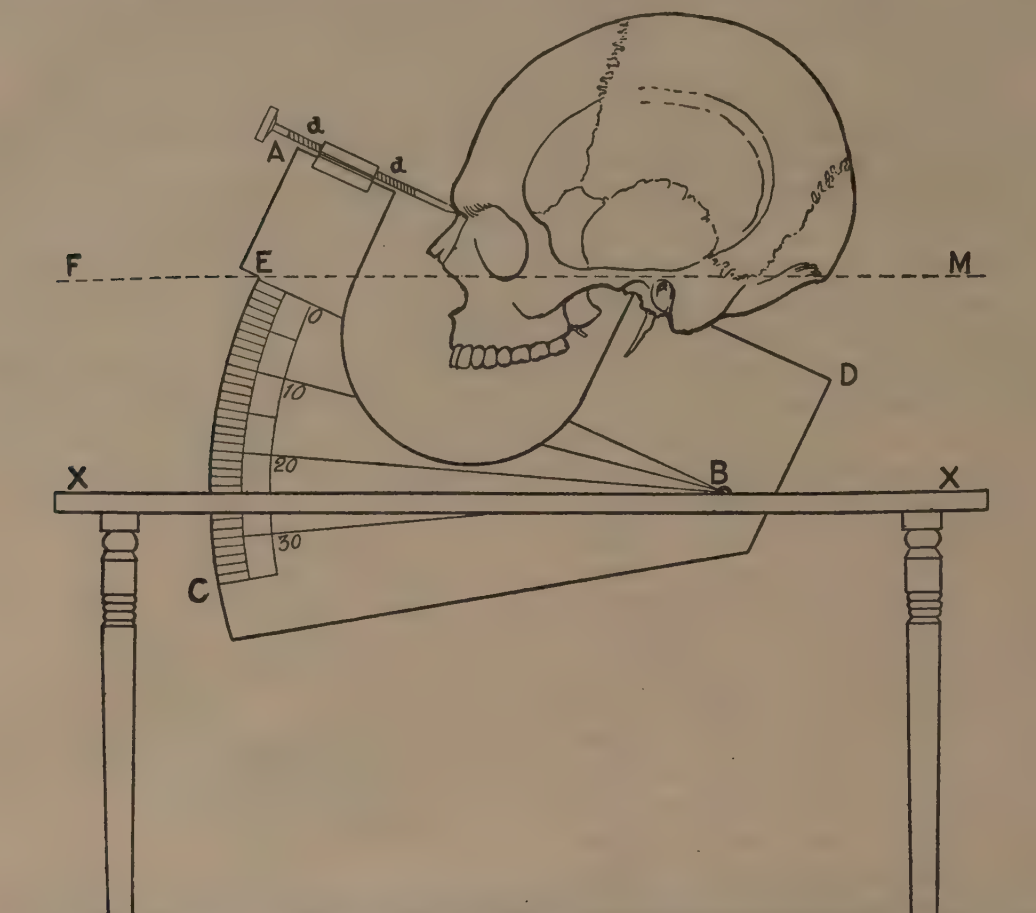


Fig. 3.

Cleland, in 1870¹, following on the same lines, proposed a modification of the above method. His base line, which extends from the opisthion to the nasion, included three parts—a middle part corresponding pretty nearly with Huxley's 'basi-cranial axis,' an anterior portion corresponding to the length of the orbit, and a posterior including the length of the foramen magnum. In dealing with Cleland's base it was necessary to note the angle formed by each of the above divisions with the others. There, again, in order to do so it was necessary to bisect the skull longitudinally.

Owing to the great morphological importance of the basi-cranial axis it seemed to us of the utmost advantage to utilize this part of the cranium as a base on which to compare the development and form of the brain capsule dorsally, as well as the variations in shape of the facial skeleton ventrally.

¹ *Phil. Trans.* 1870.

To do so, however, without entailing the division of the skull, necessitated the addition of portion of the ethmo-vomerine region to the basi-cranial axis, the two combined corresponding to the entire length of the basi-nasal line. With the view of determining whether such a method was likely to prove useful certain observations were made.

Orientation of the skull to obtain a true estimate of the projection of his face.

In the first instance, thirty-eight skulls were oriented in the now generally accepted Frankfort-Munich plane; when so disposed, the angle formed by the basi-nasal line with the horizontal plane was carefully measured by means of the craniophore, a figure of which is here given¹ (Fig. 3). The angle measured was found to vary from 22° to 34° . As has been previously stated, the thirty-eight skulls were selected because they displayed every variety of orbital form, and a variation with a range of 13 mm. between the levels of the inferior orbital margin and the nasion. Consequently there was a source of error in the orientation in the Frankfort-

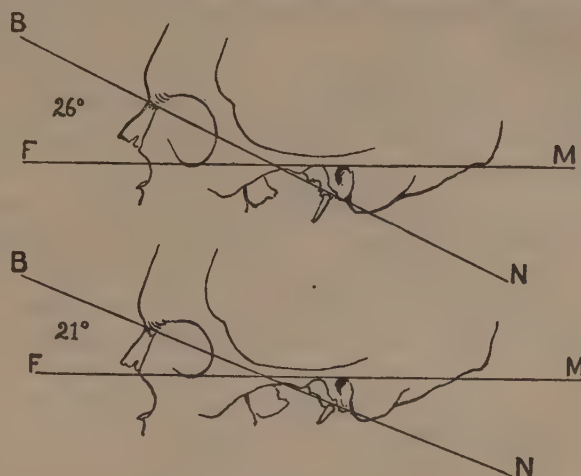


Fig. 4.

Munich plane with a possible range of 13 mm. A comparison of the results obtained² proved that as a rule the largest angles were associated with the skulls in which the inferior orbital margins were farthest removed from the level of the nasion, and conversely the narrowest angles were met with in those skulls in which the distance between the levels of the inferior orbital margin and nasion was reduced. Similarly the angle tended to widen with the numerical increase in the value of the orbital index, in other words, a skull which was megaseme, when oriented in the Frankfort-Munich plane, usually displayed a wider angle between the basi-nasal line and the horizontal than one which was microseme (see Fig. 4).

As a result of these observations, it was decided to adopt 27° as the average angle formed by the basi-nasal line with the horizontal. To orient the skull in this position all that is necessary is to place the skull on the craniophore (Fig. 3) and raise the vertical plate until an angle of 27° is reached on the scale on the arc. Another method (Fig. 5), which does not involve the use of such an apparatus, is to construct a framework sufficiently large to enclose a cranium; the sides of this frame are cut so as to form wedges the angles of which are each 27° . A thin metal plate BB of the same width as the inside of the frame is taken, and to the mid line across it is affixed a smaller wedge A with a similar angle of 27° . The frame is now so placed that the edges of the wedges fall

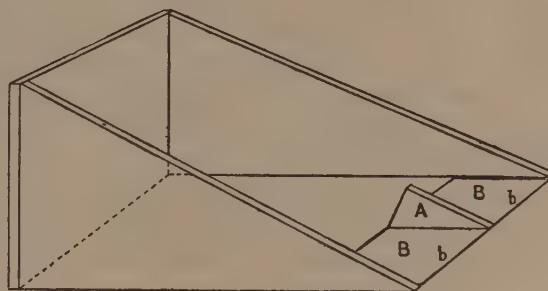


Fig. 5.

¹ For fuller description of this instrument, see Appendix, p. 123.

² See Appendix, p. 124.

Orientation of the skull to obtain a true estimate of the projection of the face.

in line with the margin bb of the metal plate BB. Over the edge of the wedge A the basion of the skull to be oriented is placed, and moved up and down until the nasion falls in line with the upper sloping edge of the outer side of the frame. The skull may then be fixed in this position and the frame withdrawn from the metal plate BB, leaving the skull so oriented that the basi-nasal line forms with the horizontal an angle of 27° .

When such a method is adopted, the basi-nasal line becomes the base on which to erect the outline of the cranial vault, whilst it also serves as the platform from which to suspend the skeleton of the face. As a matter of fact, such a method is frequently employed in the comparison of skulls, the suggested improvement being that the basi-nasal line is now placed in the approximate position which it occupies in life with the head erect. That being so, we are in a much better position to estimate the different relations of the several parts of the skull to each other, since the extremities of this line, viz. the nasion and the basion, are points which are largely employed in the mensuration of the cranium. Further, should this suggested orientation of the skull be adopted, then at last we have an easy method of estimating the varying degrees of prognathism; since a perpendicular let drop from the nasion, when the basi-nasal line is disposed at an angle of 27° , will give us a means of measuring accurately the projection of the alveolar point in front of that vertical, and, since the same conditions will be applicable in all cases, the results are more likely to be in accord with what one observes on the living man than is now the case.

When the skull is oriented in this manner it will be found that it corresponds pretty closely to the position suggested by Cleland, in which the most projecting part of the occipital condyles and the posterior boundaries of the foramen magnum both occupy the same horizontal plane.

The same observer has pointed out that the position of the skull on the vertebral column varies with growth. Assuming that in the erect position the head is very nearly balanced on the summit of the vertebral column, it follows that as the relative proportions and weight of the facial part of the skull increase during childhood and adolescence so it becomes necessary that the head be more uptilted. This effect, Cleland suggests, is probably produced by a gradually increasing prominence in the anterior extremities of the occipital condyles, which alters the plane of articulation with the atlas. Any attempt to ascertain the position in which the skull balances on a rigid rod introduced through the foramen magnum and touching the inner surface of the cranial vault, as suggested by Sir Charles Bell, is of course of no value, since the proportional weights of the anterior and posterior parts of the head may be, and doubtless are, entirely different from the proportionate weight of the corresponding parts of the macerated skull. Moreover, such a method is only applicable when the mandible is present; when the lower jaw is wanting, the balance of the cranium is of course very much altered, a fact which is frequently overlooked.

The orientation of the skull on the basi-nasal line recalls the method suggested by Aeby, who laid stress on the benefit of having a line which serves as a common base to calvaria and face alike. This advantage the present system undoubtedly possesses, and though we are aware that the situation of the fronto-nasal suture is liable to alterations in position due to the recessing of the nasal bones within the frontal, and though the nasion cannot strictly be regarded as corresponding to the precise position of the vomerine plate in relation to the face, yet, despite these objections, it appears to us to be in most respects superior to the other planes which have hitherto been suggested.

As already stated, the variations in the disposition of the lower orbital margins are liable seriously to affect the constancy of the Frankfort-Munich plane, whilst Broca's alveolo-condylic plane seems open to similar objections, since the longer the face, dependent on increased vertical height of the superior maxilla, the greater will be the upward tilt of the skull, thus imparting an appearance of excessive prognathism to the face where none such necessarily exists, for, as will be shown hereafter, prognathism depends not on the length of the upper jaw alone, but also on its splay on the cranial base. It is true that the two conditions may occur in combination, but it is also noteworthy that a long upper jaw may be so disposed as to project but little, whilst a short superior maxilla may be so placed as to form a marked protrusion. In any case it is surely a mistake to orient the skull on points which are situated on the calvaria and on the face respectively, for the relation of these points must constantly vary, since the proportions of those parts of the skull on which the points are situated are liable to alteration. It appears much better to employ a base common to both parts of the skull and so secure a means of estimating correctly the growth in either direction from that base line; for if the balance theory of the head be sound, it follows that undue face projection is counterbalanced by excess of occipital development, and not by an upward tilting of the skull such as occurs when it is oriented in Broca's plane.

Orientation of the skull to obtain a true estimate of the projection of the face.

Not less troublesome, and certainly much more confusing, is the estimation of the facial projection to which the term prognathism is applied. The word implies a protrusion of the jaw; but how this forward thrust of the facial skeleton is to be estimated, or by what standard it is to be measured, has hitherto been a matter of much difficulty, and owing to the variety of methods employed much confusion has arisen. Two factors in the growth of the upper jaw must be considered: (1) the variations in the length of its vertical diameter, which are estimated with sufficient accuracy by the measurement of the distance from the nasion to the alveolar point, and (2) variations in its horizontal length, which are conveniently expressed by taking the palatal length. In addition to these diameters the splay of the jaw upon the cranial base, which is to some extent estimated by taking the basi-alveolar length, must be considered. This measurement includes, therefore, not only the length of the jaw in a direction slightly oblique to the horizontal plane, but also the distance through which the jaw is thrust forward from the basion; the latter distance is occasionally given in some systems of measurement and is estimated by taking the distance from the basion to the posterior nasal spine, but owing to the frequency with which the basi-alveolar length is recorded in most craniometrical inquiries, that measurement may be conveniently employed to denote the forward projection of the alveolar point, irrespective of the horizontal diameter of the jaw itself, which is sufficiently expressed by the palatal length. Such being the case, it is evident that the disposition of the facial skeleton, minus the mandible and the occasional projection of the nasal bones, falls within a triangular area, the sides of which correspond to the basi-nasal, the nasi-alveolar, and basi-alveolar lengths, and since for our purpose we have accepted the basi-nasal line as the base common to the face and calvaria alike, it follows that the form of the triangle will vary according to the varying lengths of the nasi-alveolar and basi-alveolar measurements. Given the three sides of the triangle, it is of course possible to construct the triangle and so estimate accurately the position of the alveolar point. A difficulty, however, at once arises when any attempt is made to estimate the position of this point in reference to a vertical plane, for the position of the alveolar point and the vertical will vary according

Prognathism —method of determining.

Prognathism
—method of
determining.

to the horizontal in which the skull is oriented. Since the Frankfort-Munich plane, i.e. that passing through the upper part of the external auditory meatus and the infra-orbital margin, has no direct association with any of the angles of the aforesaid triangle, it becomes a matter of extreme difficulty to orient the *triangle* in relation to this plane, more particularly since the Frankfort-Munich plane is based on points which lie lateral to the mesial plane, and has no constant relation to points which fall within the mesial plane.

The alveolo-condylic plane of Broca, whilst referable to points in the mesial plane, i.e. the alveolar point, is open to the grave objection that the whole orientation of the skull depends on the development of the upper facial area; in other words, when the face is proportionately long, the whole skull when oriented in this plane acquires an upward tilt and the disposition of the calvaria is correspondingly altered, which is not necessarily the case, as may be readily proved. These difficulties, however, are in great part overcome if the skull is so oriented that the basi-nasal line is disposed at an angle of 27° with the horizontal; the nasion then becomes the point below and in front of which

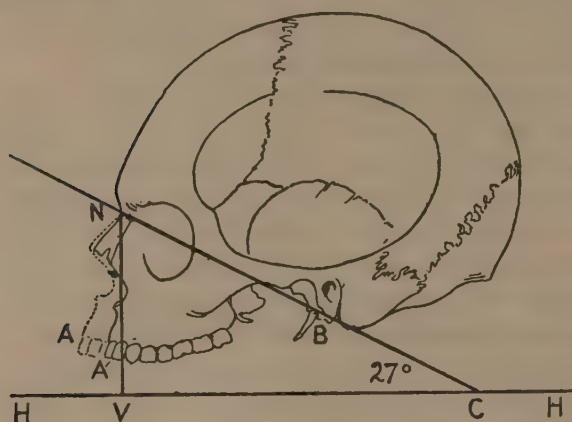


Fig. 6.

the face is developed, whilst it serves as the point from which the curve and disposition of the cranial vault may be estimated above and behind. If such an orientation be adopted, it will then be possible to determine the position of the alveolar point below the nasion, whilst by dropping a perpendicular from the nasion it will also be possible to estimate the projection of the alveolar line in advance of a vertical line passing through the nasion. This may be seen in the accompanying figure (Fig. 6), where the line NB corresponding to the basi-nasal line is prolonged to meet the

horizontal HH at an angle of 27° at C. NV is a vertical dropped from N the nasion; the projection of the alveolar points A, A' in the two outlines can easily be measured by taking their distance in front of the vertical NV.

These are advantages which none of the more generally accepted systems possess, as will be at once apparent when some of the more usually adopted methods of estimating prognathism are criticized. The plan suggested by Flower, and since largely employed for the estimation of prognathism, is open to serious objection. The basi-alveolar length is expressed in terms of 100 by reference to the basi-nasal length. Such a procedure, however, does not take into consideration any variation in the length of the third side of the triangle, i.e. the nasi-alveolar length; consequently it sometimes happens, and that more frequently than might at first appear likely, that the results obtained by Flower's method are misleading and in some cases suggest a degree of projection where none such exists.

This may perhaps be best explained by a diagram (Fig. 7). Here AB the basi-nasal line = 100. BC and BD are each basi-alveolar lengths measuring 100, but in the case of BC the point C falls well in front of AE, the vertical dropped from A the nasion, whilst in the case of BD the point D lies closer to that perpendicular. Yet in each

Objections
to Flower's
index.

instance the index of prognathism (100) is the same, though, as has been shown, the point *c* projects considerably in advance of *d*. The error, of course, is due to the fact that Flower's method does not take any account of the variations in the nasi-alveolar length, as is represented by the differences in length between the points *A* and *c*, and *A* and *D*. That such objection to his system is not hypercritical is borne out by the fact that in testing the value of Flower's index as an estimate of prognathism in a series of 161 skulls, it became apparent that indices which were identical even to the superfluous place of decimals were proved to be absolutely misleading as regards the relative projection of the jaw. This view may be confirmed by a reference to the Appendix (inset, 1-32), where our tables of prognathic projection may be compared with Flower's indices.

Objections
to Flower's
index.

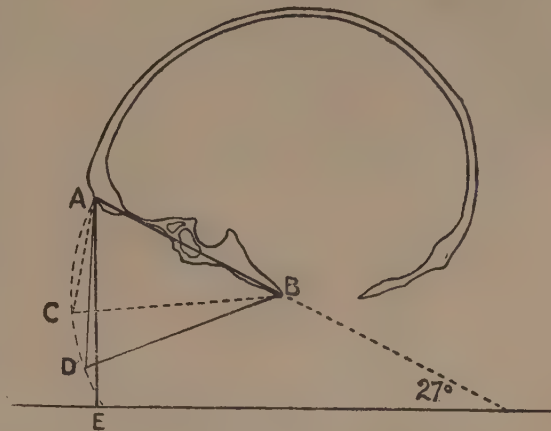


Fig. 7.

Gnathic
Angle.

In regard to the gnathic angle, we may point out that this merely expresses the angle formed by the convergence of the nasi-alveolar and basi-alveolar lines, and that this angle may remain the same despite variations in the length of these lines and simultaneous differences in the length of the basi-nasal line. But if we regard the position of the cranial base, i. e. the basi-nasal line, as constant in its relation to the cranial vault and the facial skeleton, these variations in length of the sides of the triangle, i. e. the basi-alveolar and the nasi-alveolar, whilst not altering the included angle will certainly give rise to an alteration in the disposition of that angle relative to the base. In Fig. 8 the two triangles *ACB* and *ADB* have the same base *AB* (the basi-nasal line), and they have also similar angles at *c* and *D*, yet they are so disposed that the angle *c* lies farther away from the vertical *AE* than does the angle *D*. From this it will be evident that the mere record of the gnathic angle is no criterion of the projection of the face beyond the vertical, however this vertical may be determined to fall. In other words, it fails to give us any accurate record of prognathism, whatever the system of orientation employed may be. In short, prognathism cannot be determined without also taking into consideration the absolute or relative measures of some two of the three sides of the triangle.

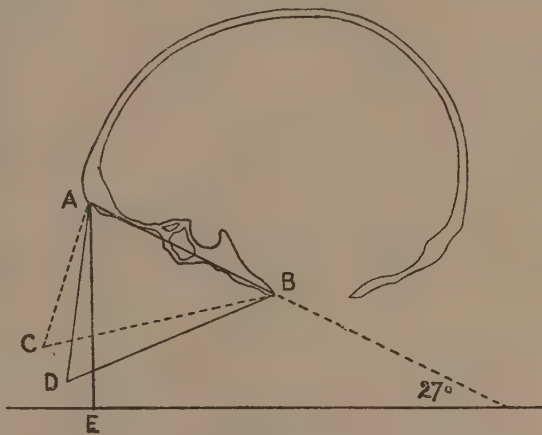


Fig. 8.

The weakness of Flower's gnathic or alveolar index, on the other hand, is that it only expresses the proportionate length of the basi-alveolar line to the basi-nasal. It fails, because it leaves out of account the nasi-alveolar length, to express correctly the precise position of the alveolar point, which can only be determined when Flower's index is supplemented by the gnathic angle.

For these reasons, in our catalogue of the measurements of the specimens we have given both Flower's index and the gnathic angle, in this way affording those who may not approve of our suggestions relating to the orientation of the skull, and the estimation of prognathism, another opportunity of determining according to their own tastes the disposition of the facial triangle¹.

Method of
determining
Prognathism
adopted.

The plan which after many experiments we decided to be the most useful for expressing the projection of the face is that which is illustrated in the accompanying figure (Fig. 9).

The basi-nasal line (BN) was drawn of 100 millimetres length and at an angle of 27° from the horizontal line (AB). At the extremity N (corresponding to the nasion) of the line BN a line NM is dropped at right angles to the horizontal AB. Prolong this line NM to a distance of 60 millimetres below the horizontal. At the extremity M draw

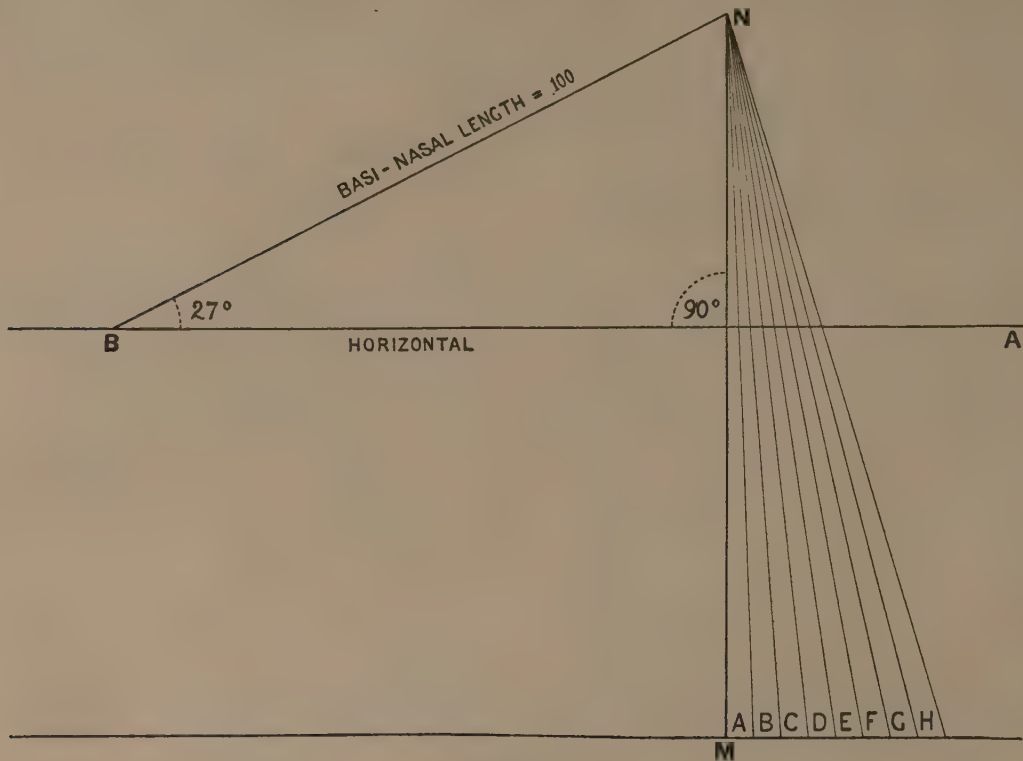


Fig. 9.

another horizontal line and on this, to the right of the line NM, measure off eight points, each 4 millimetres apart. Connect each of these points with the nasion (N) and letter the spaces from left to right A, B, C, D, E, F, G, H². When on the base BN the facial triangle is constructed, prognathism and orthognathism are registered by the place where the alveolar point falls. If the angles corresponding to the letters are measured, it will be found that all grades

¹ The absolutes to be utilized for the construction of the gnathic triangle are already given in the measures of the basi-nasal, basi-alveolar, and nasi-alveolar lengths.

² The spaces rather than the lines were selected as the primary units of classification, as experience showed this to be the most practical. In order to ensure equality of distribution, however, those specimens which fell on or near the dividing lines were denominated by a combination of the letters which they divided, thus AB, CD, &c.

below A (that is to say all marked as - A) are hyperorthognathic, all from A to D inclusive are orthognathic and mesognathic, while DE and all the grades above it are prognathic, according to the standards fixed by the Frankfort agreement¹. Our system therefore is interchangeable with that used by the German anthropologists, but it is more accurate, owing to the systematic orientation employed, as well as more convenient owing to the minuteness of its subdivisions. It has further the immense advantage that it dispenses with the difficult and tedious process of orienting the skull on a craniophore. The primary measurements needed are merely the three linear measurements, basi-nasal, basi-alveolar, and nasi-alveolar, which can be taken with the skull in any position. These have only to be combined with the gnathic angle which is obtained from them to give the true projection of the face.

In the construction of the facial triangle and the estimation of the gnathic angle we saved much time by making use of a simple contrivance of which a figure is here given (Plate I, p. 45).

The instrument consists of a brass plate, on which are engraved two lines disposed at an angle of 27° to each other. Of these, one, the basi-nasal, is marked off in millimetres from the point (B) situated at the angle which corresponds to the basion. From the point corresponding to the 100th millimetre (N) a line is drawn at right angles to the horizontal (HL). Affixed to the brass plate and corresponding to the angle formed by the basi-nasal line with the horizontal is a brass pin (B); this fits in a slot in a metal arm, the length of which corresponds to the basi-alveolar length. This is graduated from the point (A) in millimetres and can be moved backwards or forwards on the pin (B) which represents the basion. Fixed to the extremity of the basi-alveolar arm at the point (A) which corresponds to the alveolar point is another metal arm, the nasi-alveolar, one edge of which is also graduated from the point (A). This nasi-alveolar bar can be rotated on the point (A), and the angle so described can be measured on the scale on the arc (S).

In dealing with the absolutes of the sides of the facial triangle, all that is necessary is to adjust the two movable limbs to the necessary lengths and then cause the measure of the nasi-alveolar length to fall over the absolute measure of the basi-nasal length as engraved on the bed plate.

If Flower's index and the gnathic angle alone be given, all that is required to be done to ascertain the degree of prognathism is to adjust the basi-alveolar arm to the numerical value of the index, swing the nasi-alveolar limb till the required angle is reached, then rotate the two limbs so disposed on the point (B) till the edge of the nasi-alveolar arm falls across the basi-nasal line engraved on the bed plate where 100 millimetres is marked. The degree of prognathism can then be readily ascertained by noting in which compartment or on what lines (A AB B BC C &c.) the pointer falls on the engraved scale.

By the aid of this instrument we were enabled to construct the facial triangle from the absolute measurements of its three sides (basi-nasal, basi-alveolar, nasi-alveolar); we were also able to construct the same triangle in its proportional form by combining Flower's alveolar index and the gnathic angle.

Since in the latter case the base BN of the triangle was always equal to 100 (millimetres) and was always disposed in the same relation to the horizontal, it was always possible to locate precisely the position of the alveolar point in advance of a perpendicular dropped

¹ The Frankfort agreement fixed the limits of prognathism at 82° and over; of mesognathism at $83-90^\circ$; and of hyperorthognathism at 90° .

Method of
determining
Prognathism
adopted.

from the nasion, and by employing our scale of prognathism (see *ante*, p. 42) to record the extent of facial projection. In the trigonometer which we have employed (Plate 1) this scale has been engraved on the instrument, so that when dealing with the triangles reduced to their proportions (of base BN = 100) it has been possible at one operation to determine the degree of prognathism according to our scale. The same results may be obtained by the use of the diagram on p. 42 and the employment of a suitable protractor.

As not only the three absolute measurements but also the gnathic angle, Flower's alveolar index, and the resulting classification of every specimen are published in an Appendix, the reader can readily test the system and his own application of it.

Cranial
Capacity.
The method
of estima-
ting it
adopted.

With regard to the cranial capacity, we were anxious to ascertain whether or no during the centuries throughout which our periods range there had been any perceptible increase in the bulk of the cranial contents, correlated possibly with associated changes in the head form. At the time at which the specimens were examined it was considered too hazardous to subject them to the process of cubage, however delicately employed, and consequently we have no such records to submit. A number of the specimens which were sent to Oxford, and which were treated with gelatine, have been cubed with mustard-seed, and the results are interesting as enabling us to compare the measures taken with those which were obtained by estimate. Not having had individual experience in regard to this matter we had recourse for purposes of estimation to the formula

$$\frac{\text{Max. Length} \times \text{Max. Breadth} \times \text{Basi-bregmatic Height}}{2} + 1175$$

suggested in Topinard's *Anthropology*, p. 680, which is based on the assumption that the cranial cavity may be considered as equal to half the capacity contained by an ellipse having the said diameters. In comparing the fifty-one specimens of which we were able to take the cubage with the capacity estimated by this means, we found that in over 50 per cent. the variation of the estimate in excess or defect of the cubage was not more than 30 cubic centimetres, and in only 8 per cent. did it exceed 70 cubic centimetres, whilst in 12 per cent. the figures were identical by either method. On these grounds it appeared to us that the results were sufficiently accurate to form a basis for broad generalizations. Accordingly the estimated cranial capacity of the 1,500 odd specimens has been calculated in this way and recorded in the catalogue given in the Appendix.

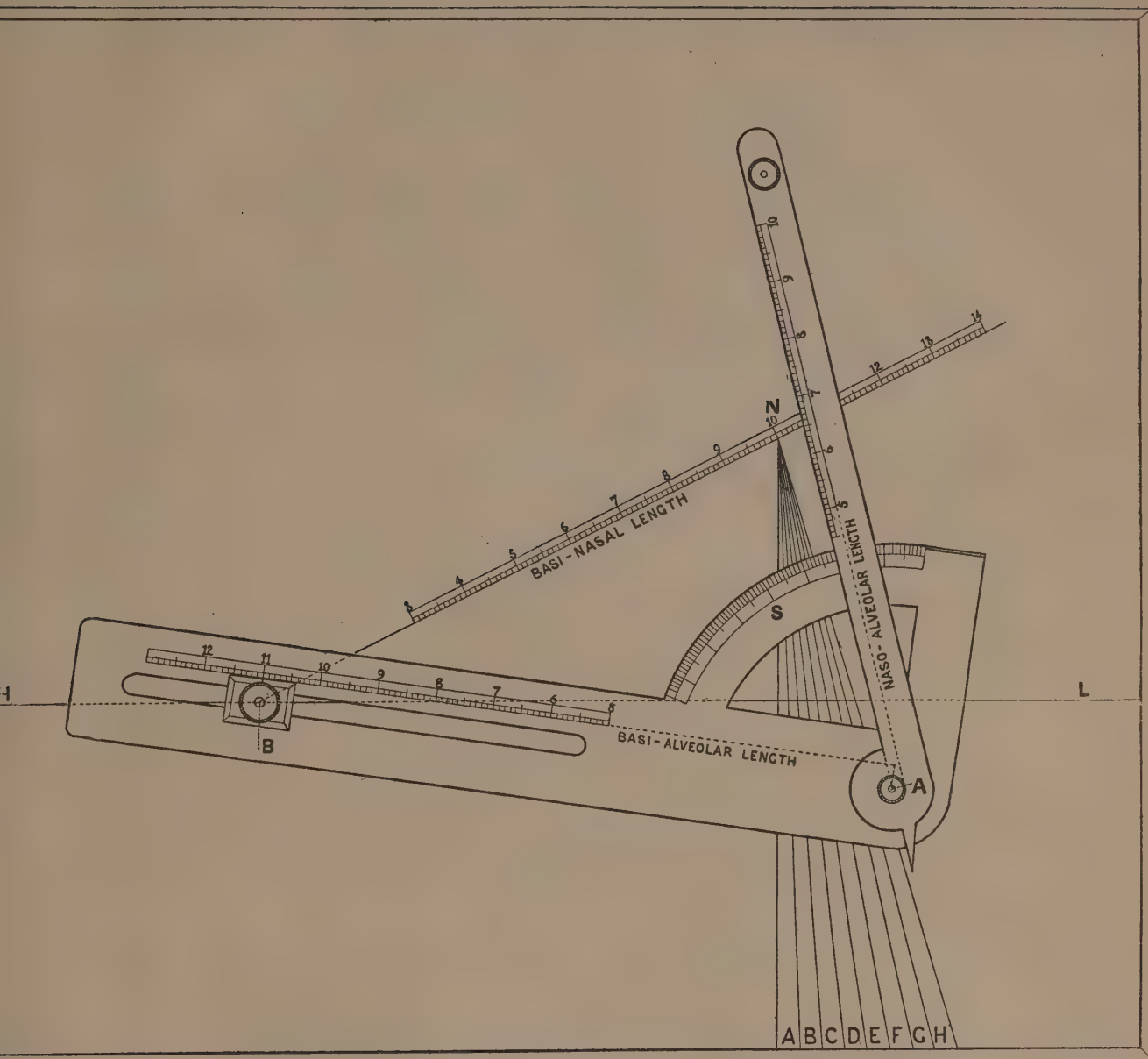


PLATE I. Trigonometer for estimating Projection of Face.

[For instructions as to use see page 43.]

CHAPTER III

NUMERICAL ANALYSIS OF THE SERIES

The Frequency Curves of indices published in the supplement.

THE classification of the various indices computed from the absolute measurements which are published in the Appendix was a problem which demanded early consideration. It was decided that there were certain advantages to be obtained by arranging the indices in curves of frequency. By this means it was possible to ascertain accurately the recurrence of the most frequent types, and to observe how far they conformed to the 'arithmetical mean' or to the 'median' of the several series. The identity of each individual specimen was preserved by entering the catalogue-number of the specimen at the places in the Frequency-Curves to which its indices assigned it; and thus the various features of any one skull could be followed through the different tables. The employment of Frequency Curves was all the more convenient as they are essential to the construction of those Probability Curves to which attention will presently be directed.

It may be well to describe briefly the method of procedure. The paper used was 'surveyor's paper' which is ruled in squares and may readily be obtained from any stationer. A base was taken of sufficient length to include the whole range of the index under consideration, and each square immediately below this base was assigned to one numerical value of the index, the values being written in serial order. Then on the verticals above the base, corresponding to the squares below it, were written one by one the catalogue-numbers of the specimens, each at its proper index-value. In this way blocks of more or less irregular outline were built up, which formed a record of the occurrence of the several grades of the different features. The term 'curve' as applied to such a figure is somewhat inappropriate, as it suggests a smoothing of the angular outline. Such a smoothing we never practised, but invariably recorded raw results, as we felt that it was far better to adhere rigidly to a system which allowed of no personal manipulation. The outlines of these blocks are represented by a hatched line in Charts I and II of the Supplement, where they are shown in combination with the Probability Curves, which will be referred to in a later chapter.

Classification of features according to the divisions commonly used in anthropometry.

For the purposes of classifying the indices the Frequency Curves were divided into sections corresponding to the main divisions into which the indices are commonly grouped. The divisions are in the

Cephalic Index	{	Dolichocephalic, all below and including 74·9.
		Mesaticephalic, 75 to 79·9.
		Brachycephalic, 80 and over.
Vertical Index	{	Tapeinocephalic, all below and including 71·9.
		Metriocephalic, 72-76·9.
		Acrocephalic, 77 and over.
Upper Facial (Kollmann's) Index	{	Chamaeprosopic, all below and including 49·9.
		Mesoprosopic, between 50 and 54·9.
		Leptoprosopic, 55 and over.

TABLE I. PERCENTAGE CLASSIFICATION OF INDICES

Analysis of Cephalic Index.

	Early Predyn.		Late Predyn.		I Dynasty.		VI-XII Dyn.		XII-XV Dyn. Hou.		XII-XV Dyn. & Abydos.		XVIII Dyn. Shekh Ali.		XVIII Dyn. S. A. & Abyd.		Roman.		Ptolemaic & Roman.	
	Dol.	Mesati.	Brach.	Dol.	Mesati.	Brach.	Dol.	Mesati.	Brach.	Dol.	Mesati.	Brach.	Dol.	Mesati.	Brach.	Dol.	Mesati.	Dol.	Mesati.	Brach.
Males . . .	76	21	3	79	20	1	67	29	4	65	32	3	73	20	7	56	44	48	36	16
Females . . .	67	31.5	1.5	60	39	1	48.5	46.5	5	42	49	9	47	42	11	29	63.5	44	46	10
Difference in favour of Males . . .	9		1.5	19			18.5			28			26			27		4		6
Females. . .		10.5					17.5	1		17	6		22	4		19.5	7.5	11	10	13

Cephalic Indices. Types as given by the Maximum of Frequency.

Males . . .	72	71	72 & 73	72	73	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Females . . .	73 & 76	73	74	75	73 & 75	75	75	73	74	75	75	74	75	75	75	75	75	75	75	75

Analysis of Cranial Capacity.

	Early Predyn.		Late Predyn.		I Dynasty.		VI-XII Dyn.		XII-XV Dyn. Hou.		XII-XV Dyn. & Abydos.		XVIII Dyn. Shekh Ali.		XVIII Dyn. S. A. & Abyd.		Roman.		Ptolemaic & Roman.	
	Micro.	Meso.	Mega.	Micro.	Meso.	Mega.	Micro.	Meso.	Mega.	Micro.	Meso.	Mega.	Micro.	Meso.	Mega.	Micro.	Meso.	Micro.	Meso.	Mega.
Males . . .	40	32.5	27.5	36	34	30	32	31	37	39	41	20	41	32	27	16	30	42	30	28
Females . . .	86	14		89	7	4	84	13	3	93	5	2	77	21	2	72	24	4	8	8
Difference in favour of Males . . .	18.5	27.5		27	26		18			36	18		11	25		6	50	9	22	28
Females. . .	46		53	53		53	52			49			36		56		47	50		62

Cranial Capacity. Types as given by the Maximum of Frequency.

Males . . .	1320 c.c.	1400 c.c.	1460 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.	1360 c.c.
Females . . .	1220 c.c.	1340 c.c.	1300 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1220 c.c.	1220 c.c.	1260 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.	1240 c.c.

Analysis of Vertical Index.

	Early Predyn.		Late Predyn.		I Dynasty.		VI-XII Dyn.		XII-XV Dyn. Hou.		XII-XV Dyn. & Abydos.		XVIII Dyn. Shekh Ali.		XVIII Dyn. S. A. & Abyd.		Roman.		Ptolemaic & Roman.	
	Tap.	Metrio.	Acro.	Tap.	Metrio.	Acro.	Tap.	Metrio.	Acro.	Tap.	Metrio.	Acro.	Tap.	Metrio.	Acro.	Tap.	Metrio.	Tap.	Metrio.	Acro.
Males . . .	25	55	20	45	53	2	21	68	11	16	68	16	36.5	58.5	5	44	46	40	52	8
Females . . .	26	66	8	33	60	7	34.5	62	3.5	21	58	21	38	51	11	40	55.5	4.5	38.5	54
Difference in favour of Males . . .			12	12			6		7.5	10		6		7.5	6	4	5.5	1.5		
Females. . .	1	11	7	5	7	5	13.5					5				11	13	2	13	

Vertical Indices. Types as given by the Maximum of Frequency.

Males . . .	73	72	75 & 76	75	75	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Females . . .	74	72	73	75	75	73	73	73	73	73	73	74	74	74	74	74	74	74	74	74

Analysis of Upper Facial Index.

	Early Predyn.		Late Predyn.		I Dynasty.		VI-XII Dyn.		XII-XV Dyn. Hou.		XII-XV Dyn. & Abydos.		XVIII Dyn. Shekh Ali.		XVIII Dyn. S. A. & Abyd.		Roman.		Ptolemaic & Roman.	
	Cham.	Meso.	Lepto.	Cham.	Meso.	Lepto.	Cham.	Meso.	Lepto.	Cham.	Meso.	Lepto.	Cham.	Meso.	Lepto.	Cham.	Meso.	Cham.	Meso.	Lepto.
Males . . .	3	33	64	2	35	63	5	22	73			6	32	62	2	33	65	4	42	54
Females . . .	2	28	70	2	37	61	2	20	78			2	33	65	1	31	68	3	43	54
Difference in favour of Males . . .	1	5		2		2	3					4			1	2		1		
Females. . .			6	2	2				5	12			1	3	3			1		

Upper Facial Indices. Types as given by the Maximum of Frequency.

Males . . .	58	55	59-55	55	55	59	58	55	55	55	55	56 & 58	55	55	55	55	55	54	55	54 & 55
Females . . .	58-60	55	55	56	55	58	58	56 & 57	58	58	58	55	55	55	55	55	55	54-56	56	56

Analysis of Nasal Index.

	Early Predyn.		Late Predyn.		I Dynasty.		VI-XII Dyn.		XII-XV Dyn. Hou.		XII-XV Dyn. & Abydos.		XVIII Dyn. Shekh Ali.		XVIII Dyn. S. A. & Abyd.		Roman.		Ptolemaic & Roman.	
	Lepto.	Meso.	Platy.	Lepto.	Meso.	Platy.	Lepto.	Meso.	Platy.	Lepto.	Meso.	Platy.	Lepto.	Meso.	Platy.	Lepto.	Meso.	Lepto.	Meso.	Platy.
Males . . .	27	37.5	35.5	25	38.5	36.5	21	55	24	46	30	44.5	20	26.5	40	36	24	31	48.5	20.5
Females . . .	21	51	28	19	42	39	11	47	42	18	46	36	30	32	22	41	37	29	38	33
Difference in favour of Males . . .	6	7.5		6			10	8				19			16	1		5	7.5	
Females. . .		13.5		3.5		2.5			18			26.5						7		

Nasal Indices. Types as given by the Maximum of Frequency.

Males . . .	47-55	53	48-51	51	47 & 49	49	49	49	49	47	47-50	49	47	47-50	49	49	49	49	50	49
Females . . .	49 & 51	51 & 54	49	49	52 & 53	44-56	52	44-56	52	46	49	52	46	49	49 & 50	46	48 & 52	46	55	55

Analysis of Orthognathism and Prognathism.

	Early Predyn.		Late Predyn.		I Dynasty.		VI-XII Dyn.		XII-XV Dyn. Hou.		XII-XV Dyn. & Abydos.		XVIII Dyn. Shekh Ali.		XVIII Dyn. S. A. & Abyd.		Roman.		Ptolemaic & Roman.	
	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.	Hyper-Ortho.	Ortho.
Males . . .	3	77	20	5			6	85	9	2	82	16	10.5	76.5	13	87	12	82	6	16
Females . . .	2.5	82.5	15	81	19		81	83	11	9	85	6	16.5	74	9.5	81	11	78	10	81
Difference in favour of Males . . .	.5		5	4					2				2.5	3.5		6	4			
Females. . .		5.5								7	1		6							

Orthognathism and Prognathism. Types as given by the Maximum of Frequency.

Males . . .	A or C	A B	C	A & A B	A	A & A B	A B	A	A	A	A	A	A B	A	A	A	A	A	A	A
Females . . .	B or C	B C		A B	A & A B	A	B C	A	A	A	A	A	B C	A B	A	A	A	A	A	A

Orthognathism and Prognathism (in agreement with the Frankfort Convention)	{ Hyperorthognathic, all below A (-A). Orthognathic and Mesognathic, A to D inclusive. Prognathic, from DE upwards.	Classifica- tion of fea- tures accord- ing to the divisions commonly used in an- thropometry.
Nasal Index	{ Leptorhine, all below and including 47.9. Mesorhine, 48 to 52.9. Platyrrhine, 53 and over.	
Cranial Capacity	{ Microcephalic, all below and including 1349.9. Mesocephalic, 1350 to 1449.9. Megacephalic, 1450 and over.	

With regard to this classification of the cranial capacity we have followed the ordinary procedure, and have not attempted to establish a separate basis of classification for males and females.

With a view to comparing the indices of the several periods the relative values of these respective primary divisions were expressed in percentages, and the results are tabulated both for males and for females in the accompanying Table (Table 1). The *type* of the people of each period as given by the 'maximum of frequency' in each diagram is entered in the same table. We are alive to the danger of laying too much emphasis on this method of classification, but as in our other analyses we have adopted the 'arithmetical mean' and the 'median' we thought that it might prove useful to give the 'maximum of frequency' for purposes of comparison.

Percentages
and Maxima
of Frequency.

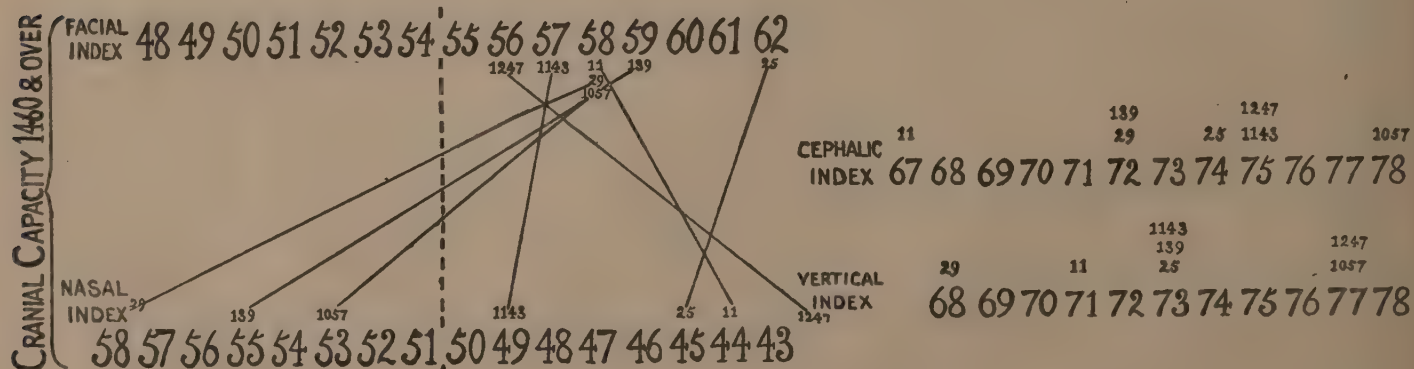
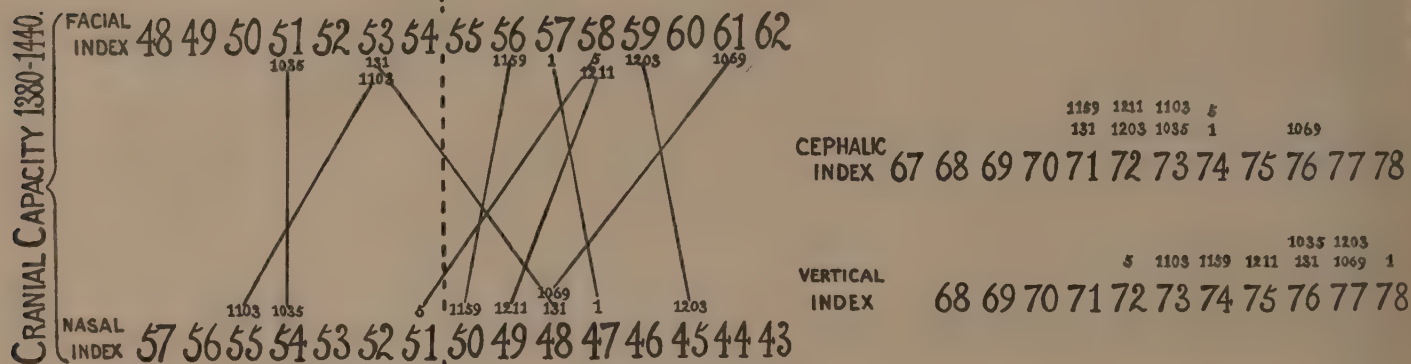
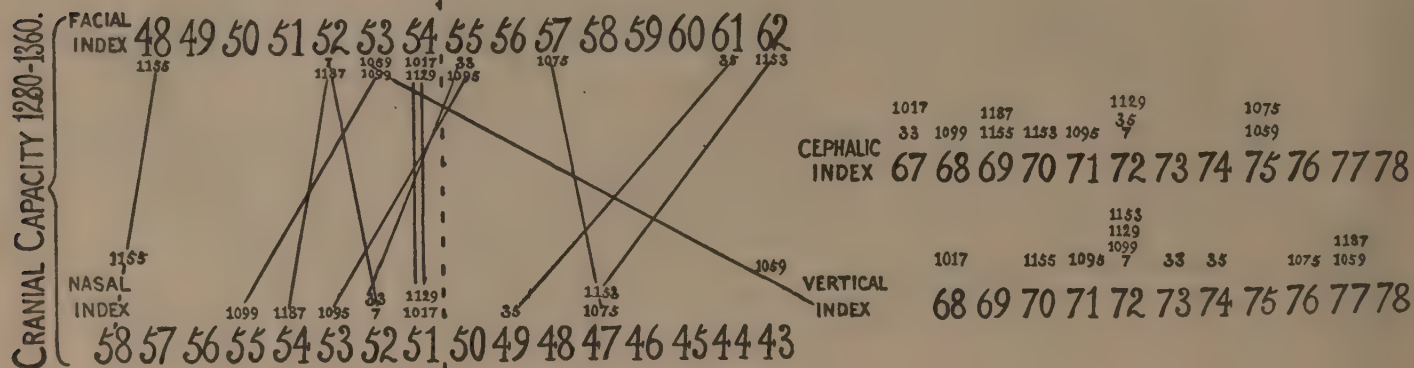
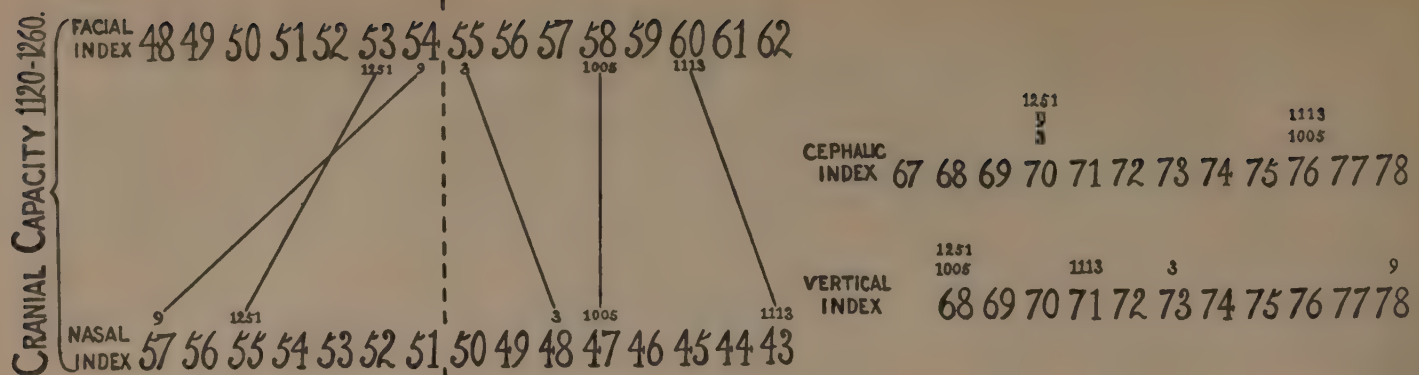


PLATE II. Example of the Graphic Analysis of Correlations.
[One period, viz. the Early Predynastic Males.]

CHAPTER IV

NEW METHODS OF ANALYSIS EXPLAINED AND THEIR RESULTS RECORDED

AT present our knowledge of the laws which determine the shape of the skull is confessedly unsatisfactory. We are familiar with certain broad principles which seem to underlie the modelling of the cranial vault and to some extent also that of the facial skeleton, yet the exceptions to what may seem to be the rule are often so numerous that their occurrence can only be accounted for by our lack of knowledge of the true principles involved. There seems undoubtedly to be evidence of a correlation between cranial capacity and head form. There seems, too, to be some connexion between cranial form and mandibular development, but with this exception the growth and shape of the face seem to be largely independent of that of the calvaria. Professor Kollmann of Basel has endeavoured to establish a correlation between head form and face form, and though in many instances this suggestion seemed fruitful, yet as a matter of experience it is common knowledge that the exceptions are likely to prove as numerous as the examples of the rule. Hitherto we have considered the various indices independently, and have endeavoured to trace throughout the various periods the modifications which the indices have undergone. It is now necessary to consider whether there is any correlation between these several indices, and whether the changes which each exhibit are in any way associated with the changes which occur in any or in all of the other indices.

On the correlation of cranial and facial forms.

Unfortunately, the data at our disposal are insufficient for us to discuss satisfactorily the correlations between cranial capacity and the cephalic index, since it appears to be a matter of much importance that in discussing this association we should also have at our command evidence of the stature of the people with whom we are dealing. There seems to be little doubt that, as a general rule of craniology, a rise in the cranial capacity is accompanied by a broadening of the head, provided always that the stature be the same. But unfortunately in the present instance, whilst, as will be seen, there is a general corroboration of this rule, yet there are exceptions which may most plausibly be accounted for on the hypothesis of a variation in the stature of the groups examined. This hypothesis is confirmed by the fact that in nearly all cases the females are less dolichocephalic than the males, their absolutely smaller cranial capacity being compensated by their shorter stature.

With only so few rules to guide us, it proved a matter of difficulty to subject the various series to any preconceived theory of correlation. We were perforce left with the only alternative, viz. that of treating our data in every possible combination in the hope of detecting such correlations as might possibly exist. In the result the opinions already expressed have been found to be abundantly confirmed. There seems to be little or no correlation, in these series at least, between head form and upper-face form; and whilst the relations between the cephalic index, vertical index, and cranial capacity are by no means inconsistent with the view that there is a close association between them, there seems ample justification for assuming that there is an intimate correlation between the form of the face and the shape of the nose.

The method of analysis which was pursued was not statistical but graphic. Two

Method of analysis

adopted to
discover
correlations.

features were taken at a time and ranged in a scale by the order of their indices one above the other. The way in which this may be done will be understood by a reference to Plate II, which contains an analysis of one period, the Early Predynastic males, selected for illustration as containing only a small number of examples in order that the reader might not be perplexed by a quantity of lines.

The features which we studied in Plate II are primarily the facial and the nasal indices. The facial indices are ranged out in consecutive ascending order from left to right, and below them the nasal indices in consecutive descending order from left to right¹. Then the individual specimens are entered each against their proper index, first in the facial, then in the nasal series, and lines are drawn connecting the points in the facial and in the nasal series at which each respective specimen occurs. The general trend of these lines is at once apparent to the eye and suggests what associations exist. In the present case it will be noticed that very few of the connecting lines intersect, that is to say that one general system of variation obtains throughout. The facial and nasal are then the primary features analysed in the tables on Plate II; but a further point is examined at the same time, and that is the question whether there is any difference in the kind and degree of facio-nasal association consequent on simultaneous differences in the other features. Thus there are four tables arranged on the basis of the cranial capacity; this is to show whether the distribution varies appreciably when the capacity is different. Next, by the side of each facio-nasal table as arranged on the basis of capacity is placed a scale of the cephalic indices and of the vertical indices of the specimens occurring in each table; this is to test whether the distribution in the facio-nasal tables varies with differences of the cephalic or of the vertical index.

Close reciprocity of variation between the upper facial and the nasal index.

The application of this system of analysis revealed a point of first-rate importance; viz. that in every single period, alike in the males and in the females, there was a close and constant harmony of variation between the facial and the nasal indices. The one feature varied constantly and regularly as the other varied; and this is a proof that, at any rate in the several series here examined, there is a real correlation between the two. A high facial index (i. e. a narrow face) was throughout associated with a narrow nose, and a low facial index (i. e. a broad face) was throughout associated with a broad nose.

Which, however, is not constantly associated with variations of other features.

Having failed to detect by this method any consistent and regular principle of reciprocal variation between two or more of the cranial characters, we proceeded to examine whether, taken individually, any of the three cranial characters were associated with variations in the facial and nasal indices. It then appeared that whereas the facio-nasal correlation was evidently one of the first degree it was not, so far as could be observed, regularly accompanied by other simultaneous modifications in the facial or in the cranial form. In one or two periods, however, there *were* associations of various degree with particular grades of other features, which may possibly be fortuitous, but which none the less demand consideration. Thus sometimes (Early Predynastic males, females; Twelfth to Fifteenth Dynasty from Hou, males, females) low facial index and platyrrhiny are associated with prognathism. Sometimes (Early Predynastic males; Twelfth to Fifteenth Dynasty from Hou, males) low facial index and platyrrhiny are associated with a rather low cephalic index, and sometimes (Early Predynastic males, females; Twelfth to Fifteenth Dynasty, Hou, males) with a rather low cranial capacity.

¹ Had the ascending order or a descending order of indices been adopted for *both*, the result would have been a quantity of intersecting lines which would have been less intelligible.

Again, high facial index combined with leptorhiny never occurs with prognathism, but is sometimes (Early Predynastic males) associated with a rather high cephalic index and sometimes (Early Predynastic males) with a rather high capacity.

The graphic method of analysis was utilized not only to demonstrate the way in which two features vary reciprocally, but also to exhibit the distribution of such variations on the scale. Now if a series of specimens is not composed of disparate elements but is homogeneous, the law of probabilities (see *infra*, Ch. VII) would demand that their distribution should be regular and uniform. The greatest number of examples ought to occur at or near the mean, and there should be a consistent decrease of frequency towards each of the extremes. But the tables of the facio-nasal correlation entirely fail to conform to this rule. Not only is it impossible to find any limits near the centre of the scale which will include a majority of the examples, but on the contrary the specimens fall naturally into two groups, one to the right and the other to the left of the centre. This compelled us to believe that we had to deal not with one but with two component factors. It was impossible to regard the distribution as resulting from the normal variation of a single medial type, and on the other hand it was naturally and immediately explicable as the outcome of the juxtaposition of two distinct groups. As each of these two groups shows within itself a close correlation of the facial and nasal indices they may be described as a short-faced or broad-faced platyrrhine, henceforward termed 'Group I,' and a long-faced or narrow-faced leptorrhine, which will be termed 'Group II' from this point onward (see p. 86).

Irregularity of the distribution of the facio-nasal association when arranged in Frequency Curves.

In the present state of knowledge it is difficult to define the range of variation for any of the cranial features, and to say within what limits a race may vary without forfeiting its claim to be regarded as homogeneous. But with the face, and still more with the nose, it is different. No one would allow that a negro nose and a European nose are simply legitimate deviations from a single race-type. And yet these are the extremes which occur in our series. The measurements alone are sufficient evidence, but an appeal to the eye must surely carry final conviction. Will any anthropologist maintain that the two groups exhibited in the photographs in Plates IV-IX are the natural variations towards platyrrhiny and leptorrhiny respectively of a stock which is mesorrhine in its typical form? If not, it must be admitted that there are two different components in our series, and that any theory which ignores this diversity must be a false one.

Consequent necessity of supposing that two opposite race-types occur.

The existence of these two component factors has been detected solely by the facial and nasal characters. It has been shown that only in two or three of the periods would an arrangement on the basis of cranial features have disclosed their presence. In most periods Dolichocephals, Mesaticephals, and Brachycephals would have shared these opposed facial types in nearly equal proportions; nor would the grades of vertical index or of capacity have differentiated them any better. We must adhere therefore to the face and nose as the basis of classification when assigning the specimens to what we may now unhesitatingly assert to be two different races¹.

The difference of these race-types shown by facial, not by cranial forms.

In carrying out the division of the component races it would have been preferable to work from photographs or originals rather than from mere indices; but unfortunately for the majority of the specimens only measurements were available. Of the 111 photographic representations of the face 93 are published in Plates IV-IX.

Corroboration of this theory afforded by photographs.

¹ Of the two features the best, if a single *fundamentum divisionis* were needed, would be the nasal. There would be fewer contradictions of type if the specimens were merely grouped as platyrrhine and leptorrhine than if they were merely grouped as chamaeprosopic and leptoprosopic.

Corrobor-
ation of this
theory
afforded by
photographs.

The remaining 18 specimens were not included, because 15 of them were damaged and three were contradictory in these characteristics¹.

Several periods are represented in Plates IV-IX, as may be seen from the catalogue-numbers which accompany the specimens. It was unnecessary to keep the periods distinct as the object was to illustrate typical differences which had already been found to persist throughout the entire history. The facial and the nasal indices of the specimens figured in these plates are published not only in the Supplement (Charts I and II), but also at the end of this chapter (Tables IV, V) for greater convenience of reference. The contrasts are especially noticeable in the males, the short broad face and broad nose of Group I conveying a quite different impression from the long narrow face and slender nose by which Group II is characterized. There is another distinguishing feature which, though unconsidered in the measurements, appears in the photographs, and that is the great width at the root of the nose (inter-orbital width) which is peculiar to Group I.

As might be expected, there are a few specimens in which the sharp distinction of the two groups is disappearing. This must inevitably result from the mixture and intermarriage of the opposite types, but undoubtedly the parent groups are predominant.

The index-
values which
delimit the
two racial
elements.

Failing photographs or originals of most of the specimens, we were obliged to rely on mere measurements for carrying out through the entire collection the division which had been indicated in the first instance by measurements and subsequently confirmed by ocular evidence. Accordingly, it was necessary to fix a hard and fast line delimiting the index-values proper to each of the two respective groups. As a matter of fact, this was not difficult. It had been ascertained by now that there *were* two groups, and it was naturally to be presumed that there would be a few intermediate and border-specimens as well as a few directly contradictory. An inspection of such graphic diagrams of the different periods as those figured on Plate II showed that a natural division occurred which could be placed at almost the same spot in all the periods. In the facial index the point of cleavage was at 54 and in the nasal at 50-51, and though there is necessarily a slight artificiality in making the division so rigid, we considered it quite legitimate to fix the limits of our two groups by these figures. Consequently, all specimens which combined a facial index of under 54 with a nasal index of over 50 were assigned to Group I, and all specimens which combined a facial index of over 54 with a nasal of under 51 were assigned to Group II. Specimens which combined the facial index proper to one group with the nasal index proper to the other were regarded as contradictions and put into a group of 'intermediates'². Those which fell just at the dividing line of the two divisions were also treated as 'intermediates'³; they

¹ In order to avoid as far as possible differences which might be due to the methods employed in photographing the skulls, the specimens were arranged in sets of ten on the arc of a circle of which the radius was 10 feet, the centre corresponding to the aperture of a rectilinear lens of 11 inches focal length. The specimens were oriented according to the position in which they were taken on lines drawn radially through the arc, the plane adopted being that recommended in the Frankfort agreement. In this way representations precisely comparable to each other and practically orthographic were obtained for all the skulls except those lettered J, which latter had been photographed in pairs on the site of the excavations with a turning-table on the camera, so that the lens pointed vertically downwards at a distance of about 4 feet from the object.

² In regard to the 'intermediates' it became apparent that the long-faced specimens among them could be separated into two classes, viz. orthognathic and prognathic, and that the prognathic class was that which was associated with platyrrhiny.

³ Specimens with a facial of 54 were put into Group I if their nasal was higher than 51, and into Group II if their nasal was lower than 51. A very low facial index with a nasal of 50 was regarded as assigning a specimen

were specimens with a facial index of 54 combined with a nasal of 51, and those with a nasal of 51 combined with a facial of 54, 55, or 56.

This rigid principle of classification was applied to all the series, and in the appended tables is given a list which shows the varying distribution of the two parent groups and the intermediates in the different periods.

The index-values which delimit the two racial elements.

TABLE II. MALES.

	Group I. Number of examples.	Group II. Number of examples.	Intermediates. Number of examples.	Group I. Percentage of examples.	Group II. Percentage of examples.	Intermediates. Percentage of examples.	Group I. Number of examples.	Group II. Number of examples.	Intermediates. Number of examples.	Group I. Percentage of examples.	Group II. Percentage of examples.	Intermediates. Percentage of examples.
Early Predynastic . . .	8	16	9	24½	48½	27½	8	18	15	19½	44	36½
Late Predynastic . . .	20	36	25	24½	44½	31	24	33	29	28	38½	33½
First Dynasty	6	10	6				18	13	19	29	29	42
Royal Tombs of First and Second Dynasties	1	11	3				2	5	3			
Sixth to Twelfth Dynas- ties	31	81	37	20½	54	25	15	52	42	13½	47½	38½
Twelfth to Fifteenth Dyn- asties from Hou . . .	10	31	9	20	62	18	8	24	19	16	47	37
Twelfth to Fifteenth Dyn- asties from Abydos . .	0	9	2				5	15	11	16	48½	35½
Eighteenth Dynasty from Abydos	8	31	10	16½	63	20½	12	34	17	19	54	27
Eighteenth Dynasty from Shekh Ali . . .	8	22	7	22	59	19	7	24	15	15½	52½	32½
Thirtieth Dynasty . . .	3	8	5				3	6	6			
Ptolemaic period . . .	10	35	27	14	48½	37½	17	24	15	30½	43	26½
Roman period	8	21	11	20	52½	27½	11	18	15	25	41	34

Distribution of the component racial groups in the different periods.

TABLE IV. MALES.

Males of Group I.			Males of Group II.			Males of Group II (cont.).		
Catalogue Numbers.	Facial Index.	Nasal Index.	Catalogue Numbers.	Facial Index.	Nasal Index.	Catalogue Numbers.	Facial Index.	Nasal Index.
B125	50	62	J93	60	42	R619	55	53
B155	52	60	K11	60	43	R610	61	52
B141	56	58	J55	54	48	R602	62	49
D421	54	57	B175	55	43	R606	53	48
A9	54	57	A25	62	45	K47	55	47
L1	56	55	A11	58	44	D425	62	43
K73	56	52	A35	61	49	K69	53	44
R617	54	56	J25	54	48	J17	58	50
R601	56	55	J65	56	43	B167	55	48
J13	54	55	J9	59	47	C517	55	47
B115	55	54	B213	60	50	D405	53	46
B211	54	52	A1	57	47	J87	55	50
J21	56	52	D406	63	47	C511	50	48
K77	54	51	B255	59	52	J35	54	51
K79	54	50	D403	59	48	R612	54½	51
K17	55	50	R615	54½	52	D430	54	49
D415	52	50	R616	60	52	L7	57	48
J41	55	49	R618	56	46	J1	60	47

TABLE V. FEMALES.

Females of Group I.			Females of Group II.			Females of Group II (cont.).		
Catalogue Numbers.	Facial Index.	Nasal Index.	Catalogue Numbers.	Facial Index.	Nasal Index.	Catalogue Numbers.	Facial Index.	Nasal Index.
C82	55	57	A10	57	49	J70	61	42
R613	54	57	J106	57	42	R605	53	42
B138	57	57	J48	57	51	K84	60	50
R611	52	56	C64	55	47	A50	54	49
J6	50	56	B112	54	50	C94	56	49
J28	57	56½	B134	53	45	C510	59	49
R607		55	C88	60	45			
J54	53	54	K80	57	45			
B170	59	54	C58	62	53			
D440	56	53	J26	55	47			
J32	54	52	A32	53	46			
A14	53	51	D426	57	46			
L14	54	51	J108	59	46			
K82	55	51	C70	53	45			
D432	47	48	D423	53	48			
			D428	53	49			
			A30	56	41			
			A20	55	52			

Facial and nasal indices of the specimens figured in Plates IV-IX.

to Group I, and a very high facial with a nasal index of 51 as assigning it to Group II. Facial indices of 54, 55 and 56 in combination with nasal of 50 were classed to Group II.

CHAPTER V

THE SYSTEM OF SCHEMATIC DIAGRAMS AND ITS RESULTS

The principle of schematic diagrams of correlations.

THE employment of the graphic method of analysis, of which the results have been recorded in the last chapter, was suggested by the paper in *Man* (1902, art. 95). It was there shown to be practicable to construct within a square certain quadrilateral figures representing simultaneously the types derived from the indices of four different features. The outline of the figures so found differed conspicuously in different peoples, so that the varying shapes of the quadrilaterals left on the pictorial imagination an impression of the racial differences which is likely to be more permanent than the memory of mere numerical values. The principle of the system was described as follows.

How such diagrams are constructed.

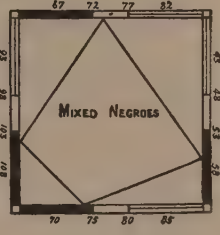
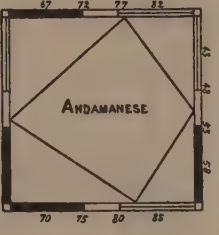
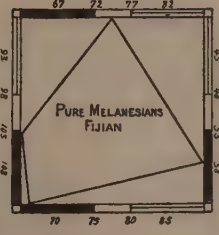
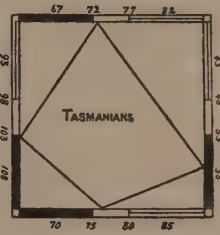
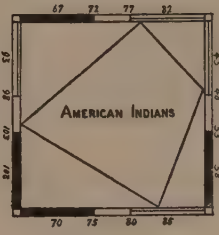
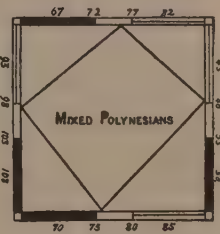
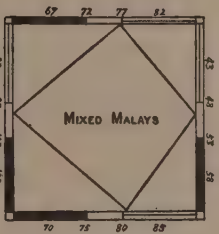
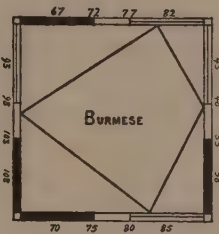
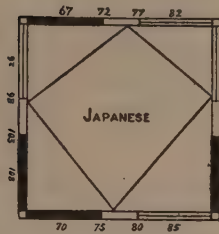
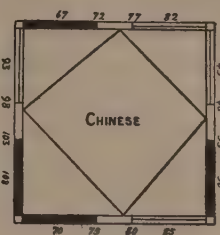
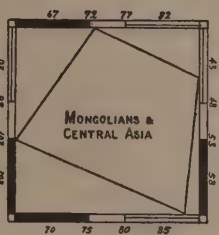
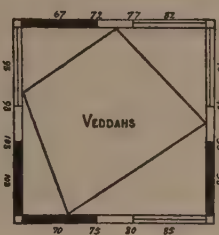
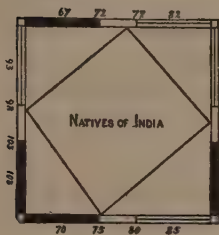
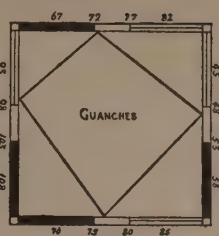
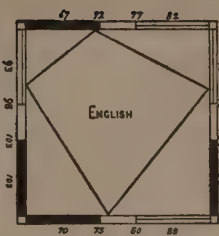
'On millimetre paper, or, if that cannot be obtained, on ordinary surveyor's paper (which is ruled in squares), construct a square. The sides of this square are each taken to represent the range of whatever indices are chosen for the purposes of comparison. Thus, supposing we wish to compare the cephalic, vertical, alveolar, and nasal indices of several series of skulls, we assign a side of the square to each one of these indices. The length of the side is then measured off to correspond with the range of the index with which it agrees. Thus, if we assign the lower side of the square to the cephalic index we may divide it up into twenty-five or thirty parts ranging in numerical value from sixty or sixty-five to ninety, thus covering the probable range of the index. Similarly the upper side of the square may be allotted to the vertical index, whilst the sides may be assigned to the alveolar and nasal indices respectively, the range of variation being estimated by the numerical values of the extreme indices. It will further be found a matter of some convenience if the meso-indices are made to correspond to the middle fifth or so of the sides of the square; in this way we can conveniently subdivide the sides of the square into three parts, each corresponding to the lower, the meso, and the higher indices of the four series of indices, in conformity with the descriptive terms commonly employed to signify these subdivisions.

'If we are comparing a series of skulls we may take the arithmetical mean, the median, the maximum of frequency or "type" of each of the indices which we have chosen. Having made the selection according to individual taste, or the data supplied in the tables we are analysing, then mark off on each side of the square the numerical point which corresponds to the averages, medians, or types. By connecting these four points by four lines a quadrilateral figure is formed disposed within the square—the shape of this figure necessarily depends on the position of its angles and the lengths of its sides, which are determined by the position of the points which have been plotted on the sides of the square.

'Much, of course, will depend on the indices selected for comparison, and the resulting figures will vary accordingly. Experience alone can teach us which are the indices of greatest ethnic value, and in making any such selection it will be well to choose only those which display the greatest racial constancy¹.'

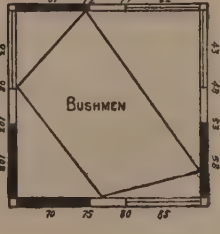
¹ *The Use of Diagrams for Craniometrical Purposes.* By Arthur Thomson, M.A.

VERTICAL INDEX



THE TOPS OF THE SQUARES REPRESENT THE VERTICAL INDICES
 • BOTTOMS " " " CEPHALIC "
 • LEFT SIDES " " " ALVEOLAR "
 • RIGHT SIDES " " " NASAL "

GRAPHIC REPRESENTATION OF SIR W. FLOWER'S
 TABLE IN THE CATALOGUE OF THE ROYAL COLLEGE
 OF SURGEONS OF ENGLAND.



CEPHALIC INDEX

PLATE III. An Illustration of the way in which Racial Differences may be expressed by Schematic Diagrams.

An illustration of their employment to express racial types.

The results of expressing in this way the characteristics of twenty-two series from different parts of the world are shown in the diagrams (Plate III) on the preceding page, which were based on Sir W. Flower's catalogue of the collection in the Royal College of Surgeons. The reader may decide for himself whether this does not convey to his mind a more definite idea of the differences characterizing the various races or populations than he would have obtained from any array of numerical averages elucidated only by such descriptive terms as 'Dolichocephalic,' 'Brachycephalic,' 'Leptoprosopic,' 'Chamaeprosopic,' &c., &c. One caution, however, must be given in passing. Plate III is given as an illustration of method, but it must not be taken as a final judgment on the characteristics of the races included in it, as Sir W. Flower's series are too small to eliminate the element of chance. To take an example which has a bearing on our immediate subject, his series of 'Ancient Egyptians' includes at most 30 examples, of which the dates are unknown, and of course such a series is at once superseded when a large body of material becomes available.

Application of such diagrams to purposes of this work.

We have employed this graphic method to express the types as they appear in each of the periods of Egyptian history with which the present volume deals. The features selected for comparison are the four which were found to be the most characteristic, viz. the estimated cranial capacity, nasal index, cephalic index, and facial index. The type for each of these was taken from the 'median' of the measurements, as being more trustworthy than either the maximum of frequency or the arithmetical mean when the series (as is the case in Plates XIII, XIV, XV) are small.

In Plates X, XI, XII are exhibited the types obtained for males, females, and combined males and females of the several series unanalysed into their component groups. In Plates XIII, XIV, XV are given the types for each of the two groups into which, as shown in the preceding chapter, the several series may be analysed. The number of specimens available for the two groups in each period may be seen by reference to p. 53, Tables II, III.

To avoid misunderstanding it may be well to quote the actual numerical figures of the medians.

TABLE VI

(Corresponding to Plate X. Males).

TABLE VII

(Corresponding to Plate XI. Females).

TABLE VIII

(Corresponding to Plate XII. Males and Females).

	Capacity.	Upper Facial.	Cephalic.	Nasal.	Capacity.	Upper Facial.	Cephalic.	Nasal.	Capacity.	Upper Facial.	Cephalic.	Nasal.
Early Predynastic	1370	56	71½	50½	1250	56½	72½	50½	1310	56½	72	50½
Late Predynastic	1390	55½	72	50½	1260	55	73½	50½	1310	55	73	51
First Dynasty	1440	53½	72½	50	1250	55	73½	52	1340	54½	73	51½
Royal Tombs	1430	55½	74	48½	1300	55½	74½	50	1400	55½	74½	49
Sixth to Twelfth Dynasties	1410	55½	73½	50½	1255	56½	74½	51	1340	56½	74	50½
Twelfth to Fifteenth Dynasties from Hou	1360	56	72½	48½	1240	57	74½	51	1290	56½	74	49½
Twelfth to Fifteenth Dynasties from Abydos	1460	55	74	48½	1280	56½	75½	50	1300	56½	75	49
Eighteenth Dynasty from Sheikh Ali	1360	55½	72½	47½	1250	55	74½	49½	1320	55½	73½	49
Eighteenth Dynasty from Abydos .	1460	55½	73½	49	1300	55½	75½	50½	1350	55½	75	50
Thirtieth Dynasty	1360	54½	72½	47½	1240	54½	73½	49½	1270	54½	73	48½
Ptolemaic period	1390	54½	73½	49	1250	55	75½	50½	1340	54½	74½	49
Roman period	1370	55½	75	48½	1220	55½	75	51	1320	55½	74½	50

TABLE IX (*corresponding to Plate XIII. Males divided series*).

	Capacity.		Upper Facial.		Cephalic.		Nasal.	
	Group I.	Group II.	Group I.	Group II.	Group I.	Group II.	Group I.	Group II.
Early Predynastic	1320	1400	52½	58	71	73½	55	47
Late Predynastic	1890	1400	52½	57½	71½	71½	54	46½
First Dynasty	1370	1410	51½	55½	74½	73½	54½	48½
Royal Tombs	—	1420	—	56	—	74	—	45½
Sixth to Twelfth Dynasties	1380	1480	52	58	73	73½	54½	48
Twelfth to Fifteenth Dynasties from Hou	1340	1380	53	58½	72½	72½	56	46
Twelfth to Fifteenth Dynasties from Abydos	—	1470?	—	55	—	74	—	48½
Eighteenth Dynasty from Shekh Ali	1330	1370	51½	57	72	73	52½	47
Eighteenth Dynasty from Abydos	1420?	1430	53	56½	73½	74	54	47
Thirtieth Dynasty	—	1370	—	57	—	73	—	47
Ptolemaic period	1390	1390	52	56	73	73½	53½	47½
Roman period	1420	1370	50½	57½	77	74	53½	46

Applications of such diagrams to purposes of this work.

TABLE X (*corresponding to Plate XIV. Females divided series*).

Early Predynastic	1190	1210	51½	59	75	71½	54½	47½
Late Predynastic	1280	1260	52½	56	73	74½	54	48½
First Dynasty	1270	1360	52	58	73½	74	54	48
Royal Tombs	—	1340	—	57½	—	74	—	48
Sixth to Twelfth Dynasties	1310	1260	52½	58	74½	75	55½	49
Twelfth to Fifteenth Dynasties from Hou	1200	1240	52	58	74	74½	52	48
Twelfth to Fifteenth Dynasties from Abydos	1250	1310	53	57½	75	77	54	47½
Eighteenth Dynasty from Shekh Ali	1250	1240	53	56	73	74	54½	47
Eighteenth Dynasty from Abydos	1340	1260	52	57	75	75½	55	48½
Thirtieth Dynasty	—	1260	—	56½	—	75	—	48
Ptolemaic period	1260	1260	51½	56½	75½	75½	55	47½
Roman period	1250	1200	51	57	75	74½	55	47½

TABLE XI (*corresponding to Plate XV. Males and Females combined in the divided series*).

Early Predynastic	1270	1280	52½	58½	73½	72½	54½	47½
Late Predynastic	1300	1330	52½	56½	73	73½	54	47½
First Dynasty	1320	1370	52	56½	74	73½	54½	48½
Royal Tombs	—	1380	—	57	—	74	—	46½
Sixth to Twelfth Dynasties	1360	1350	52	58	74	74	54½	48½
Twelfth to Fifteenth Dynasties from Hou	1290	1340	53	58	73½	73½	53½	46½
Twelfth to Fifteenth Dynasties from Abydos	—	1360	—	57	—	75	—	48
Eighteenth Dynasty from Shekh Ali	1300	1320	52	56½	72	73½	53½	47
Eighteenth Dynasty from Abydos	1360	1350	52½	56½	74½	75	54½	48
Thirtieth Dynasty	1240?	1350	51½	57	73	73	53½	47
Ptolemaic period	1290	1370	52	56½	74½	74	55	47½
Roman period	1310	1280	50½	57	75½	74½	54	46½

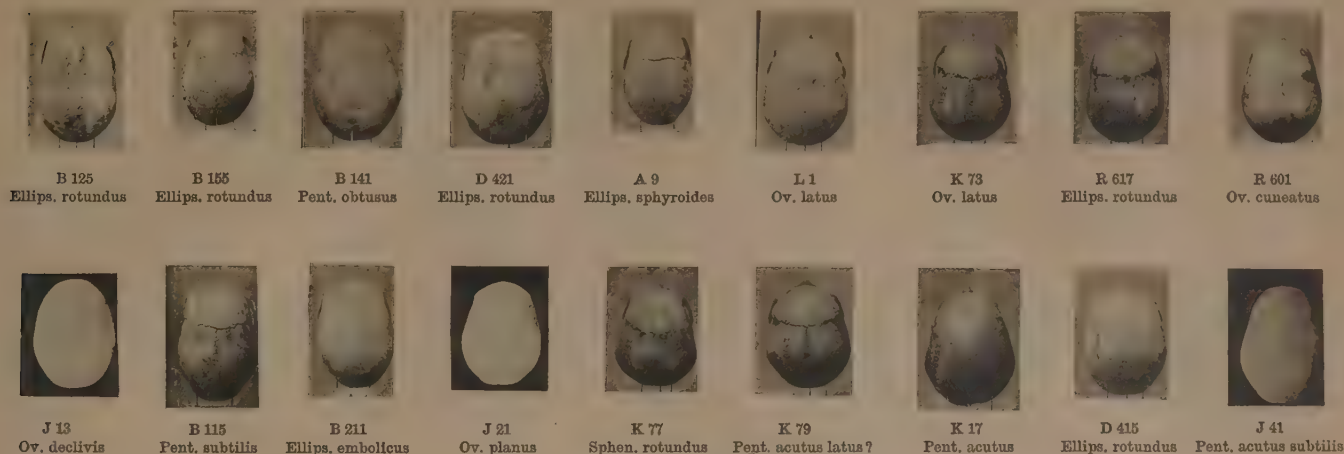
Remarks on
the results
shown by the
schematic
diagrams.

For the present the diagrams may be allowed to speak for themselves ; there will be occasion later to refer to them in detail. It is interesting to see how the series in Plates x to xii, which but for the analysis epitomized in the last chapter would probably have been regarded as homogeneous, are in reality made up of the cancellings and compromises resulting from the juxtaposition of two disparate series to which a certain number of intermediates have been added. It is evident that the several series differ greatly from one another, and though in some cases the explanation may be found in the numerical preponderance of one of the two groups, yet in other cases that explanation is insufficient, and it will be necessary to adopt one of two hypotheses, viz. either natural evolution or foreign invasion.

It may further be pointed out that these diagrams of types elicit some evidence of correlations which the analysis of distribution failed to detect. Thus it will be seen that a rise in the Cranial Capacity is usually accompanied by a rise in the Cephalic Index ; in other words, the greater the cranial contents the rounder does the head tend to become. Similarly it may be seen that shortening of the face and relative increase in its width is in most cases accompanied by widening of the nasal aperture.

VIEWS OF THE VAULTS OF THE MALE CRANIA ARRANGED ACCORDING TO GROUPS

The Vault views, as will be seen, do not serve to distinguish the Groups. Professor Sergi's classification is appended to each skull.



GROUP I. NEGROID



GROUP II. NON-NEGROID

The numbers appended to the above illustrations of skulls are the catalogue-numbers as given in the Appendix and Charts.

The alphabetical letters refer to the several periods thus—

A = 'Early Predynastic'

C = 'First Dynasty'

B = 'Late Predynastic'

D = 'Royal Tombs'

J = 'Eighteenth Dynasty from Abydos'

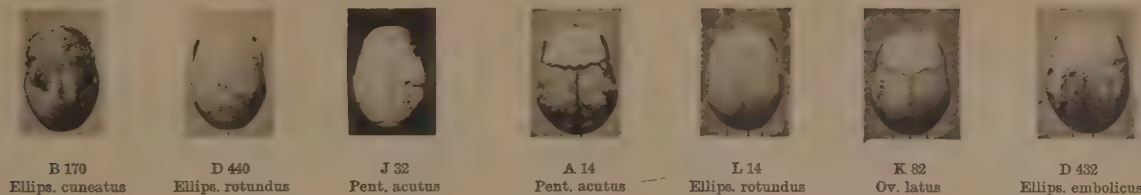
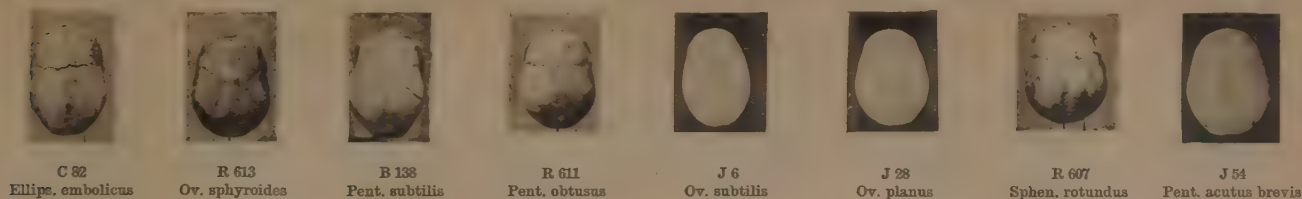
K = 'Eighteenth Dynasty from Shekh Ali'

L = 'Thirtieth Dynasty'

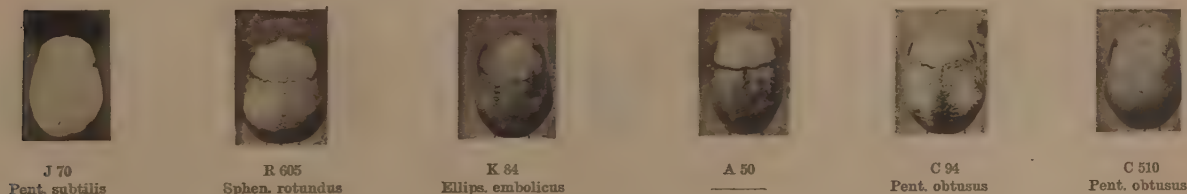
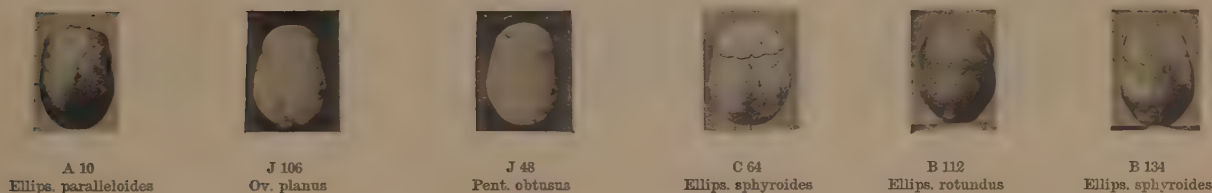
R = 'Third and Fourth Dynasties from Regannah'

VIEWS OF THE VAULTS OF THE FEMALE CRANIA ARRANGED ACCORDING TO GROUPS

The Vault views, as will be seen, do not serve to distinguish the Groups. Professor Sergi's classification is appended to each skull.



GROUP I. NEGROID



GROUP II. NON-NEGROID

The numbers appended to the above illustrations of skulls are the catalogue-numbers as given in the Appendix and Charts.

The alphabetical letters refer to the several periods thus—

A = 'Early Predynastic'

C = 'First Dynasty'

J = 'Eighteenth Dynasty from Abydos'

L = 'Thirtieth Dynasty'

B = 'Late Predynastic'

D = 'Royal Tombs'

K = 'Eighteenth Dynasty from Shekh Ali'

R = 'Third and Fourth Dynasties from Regagnah'

FULL-FACE VIEWS OF THE MALE CRANIA ARRANGED ACCORDING TO GROUPS



B 125

B 155

B 141

D 421

A 9

L 1

K 73

R 617

R 601



J 13

B 115

B 211

J 21

K 77

K 79

K 17

D 415

J 41

GROUP I. NEGROID



J 93

K 11

J 55

B 175

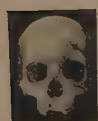
A 25

A 11

A 35

J 25

J 65



J 9

B 213

A 1

D 406

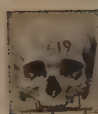
B 255

D 408

R 615

R 616

R 618



R 619

R 610

R 602

R 606

K 47

D 425

K 69

J 17

B 167



C 517

D 405

J 87

C 511

J 35

R 612

D 430

L 7

J 1

GROUP II. NON-NEGROID

The numbers appended to the above illustrations of skulls are the catalogue-numbers as given in the Appendix and Charts.

The alphabetical letters refer to the several periods thus—

A = 'Early Predynastic'

B = 'Late Predynastic'

C = 'First Dynasty'

D = 'Royal Tombs'

J = 'Eighteenth Dynasty from Abydos'

K = 'Eighteenth Dynasty from Shekh Ali'

L = 'Thirtieth Dynasty'

R = 'Third and Fourth Dynasties from Regagnah'

FULL-FACE VIEWS OF THE FEMALE CRANIA ARRANGED ACCORDING TO GROUPS



C 82

R 613

B 138

R 611

J 6

J 28

R 607

J 54



B 170



D 440



J 32



A 14



L 14



K 82



D 432

GROUP I. NEGROID



A 10



J 106



J 48



C 64



B 112



B 134



C 88



K 80



C 53



J 26



A 32



D 426



J 108



C 70



D 423



D 428



A 30



A 20



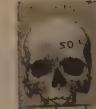
J 70



R 605



K 84



A 50



C 94



C 510

GROUP II. NON-NEGROID

The numbers appended to the above illustrations of skulls are the catalogue-numbers as given in the Appendix and Charts.

The alphabetical letters refer to the several periods thus—

A = 'Early Predynastic'

C = 'First Dynasty'

J = 'Eighteenth Dynasty from Abydos'

L = 'Thirtieth Dynasty'

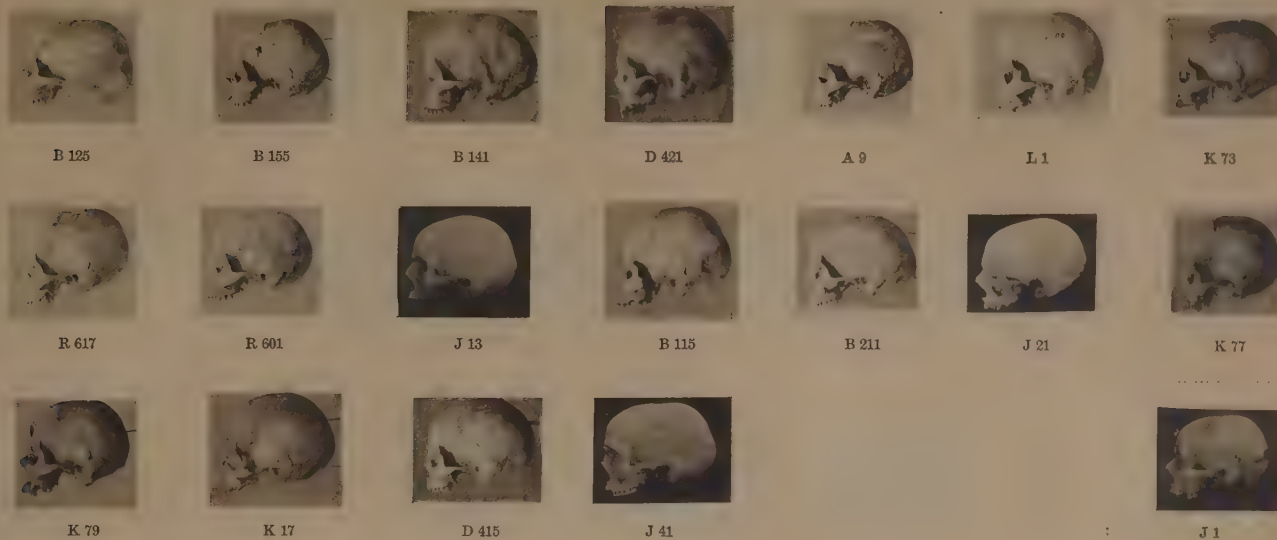
B = 'Late Predynastic'

D = 'Royal Tombs'

K = 'Eighteenth Dynasty from Shekh Ali'

R = 'Third and Fourth Dynasties from Regagnah'

PROFILE VIEWS OF THE MALE CRANIA ARRANGED ACCORDING TO GROUPS



GROUP I. NEGROID

GROUP II
NON-NEGROID



GROUP II. NON-NEGROID

The numbers appended to the above illustrations of skulls are the catalogue-numbers as given in the Appendix and Charts.

The alphabetical letters refer to the several periods thus—

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B = 'Late Predynastic'

C = 'First Dynasty'
D = 'Royal Tombs'

J = 'Eighteenth Dynasty from Abydos'
K = 'Eighteenth Dynasty from Shekh Ali'

L = 'Thirtieth Dynasty'
R = 'Third and Fourth Dynasties from Regagnah'

PROFILE VIEWS OF THE FEMALE CRANIA ARRANGED ACCORDING TO GROUPS



C 82



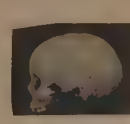
R 613



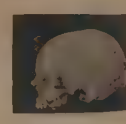
B 138



R 611



J 6



J 28



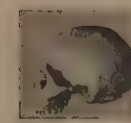
R 607



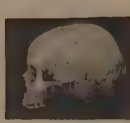
J 54



B 170



D 440



J 32



A 14



L 14



K 82

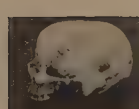


D 432

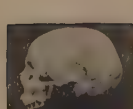
GROUP I. NEGROID



A 10



J 106



J 48



C 64



B 112



B 134



C 88



K 80



C 58



J 26



A 32



D 426



J 106



C 70



D 423



D 428



A 30



A 20



J 70



R 605



K 84



A 50



C 94



C 510

GROUP II. NON-NEGROID

The numbers appended to the above illustrations of skulls are the catalogue-numbers as given in the Appendix and Charts.

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L = 'Thirtieth Dynasty'

R = 'Third and Fourth Dynasties from Regagnah'

CHAPTER VI

ON PROFESSOR SERGI'S SYSTEM AND THE RESULTS OBTAINED FROM IT

IN pursuance of our scheme to utilize every available means at our disposal for the elucidation of the problems arising out of the present research, it was natural that we should have recourse to the methods recently devised by the distinguished Italian anthropologist, Professor G. Sergi. To him we must express our unqualified thanks for the kind assistance he has rendered, and the help which has enabled us to classify according to his own views the skulls of which we possess photographs. The refinements of some of his classifications are such that it would have been impossible for us to have grouped the specimens, as has been done, without running the risk of, in some instances at least, falling into error. It is only fair to Professor Sergi, however, to point out that as he had only the photographs of the skulls at his disposal he was labouring under a disadvantage. He requested us to rectify any errors that might under these conditions have occurred, but we considered it in every respect more satisfactory to leave the classification just as it came from his hand.

For the benefit of those readers who are not familiar with the views of the Italian anthropologist, it may be well to state that the chief principle involved is the substitution of terms descriptive of actual shape for the accepted indices of cranial form. He takes up the attitude that the shapes of the skull, as viewed from the *norma verticalis*, are 'persistent alike in geographical distribution and in the order of time, and are therefore reliable elements for classification¹,' an attitude which is based upon his assumption that the 'interior' characteristics of man, by which he means the skeletal parts, are 'not affected by the external influences of habitat, climate, or nourishment²'; a view, it must be remarked, which seems inconsistent with recognized biological laws.

Principles of Prof. Sergi's classification of crania.

It is undoubtedly true that heredity is an influence of great potency, and in this respect considerable support is given to Professor Sergi's views, but we cannot accept his reiterated assertion of the unalterable character of all his types as demonstrated even by the evidence of such cases as he has adduced.

In the application of his system to our present inquiry we are confronted with this difficulty, viz. that up to the present Professor Sergi has confined his researches to what he terms the Eurafrian and the Eurasian 'species,' groups to which he assigns the following characteristics. The Eurafrian species is distinguished by Ellipsoidal, Ovoidal, and Pentagonoidal shapes (with a few secondary forms); the Eurasian by Spheroidal, Sphenoidal, and Platycephalic (with a corresponding series of sub-forms³). As yet, however, he has not extended the application of his own particular method to the study of Negroid races. We are, therefore, at a loss to utilize his method for the purposes of our present inquiry, since the Negroid influence is precisely one of the factors, the presence or absence of which it is necessary to determine. A moment's consideration

Difficulty of applying his system in the present case.

¹ *Specie e varietà umane*, p. 51.

² *Ibid.*, p. 168.

³ *Arii e Italici*, pp. 179, 183, &c. To each of these groups of skull forms, it should be remarked in passing, he attributes definite corresponding forms of face.

Difficulty of applying his system in the present case.

will make it clear to the reader that the characteristics assigned by Professor Sergi to each of his groups are the very characteristics expressed in other and more familiar phraseology by the terms Dolichocephalic and Brachycephalic. And since Dolichocephaly may be regarded as a characteristic of at least some amongst the Negro races, while Professor Sergi recognizes that the Negroes are wholly distinct from his long-headed Eurafricans¹, it is difficult to see how, without invoking other aid than that of his own system, he will succeed in differentiating this third unit from the 'species' which he has already established.

Meanwhile we admit the advantage of such precise descriptive terms, though we hesitate to accept the view that they denote unchanging types.

Comparison of a classification on Prof. Sergi's system with the results obtained by other methods.

In Table XIII is given a complete analysis of all the specimens of which photographs were submitted to Professor Sergi for classification. The same specimens, which form but a small proportion of our total material, have also been divided by ourselves into the two groups to which reference has already been made. We may here remind the reader that we have assigned to Group I the following characteristics, short broad face and broad nose; and to Group II, long narrow face and slender nose. The following list (derived from Table XIII) shows at a glance how the varieties enumerated by Professor Sergi are distributed within our two groups.

Thus in *Group I* there are:

- 13 Ellipsoids (8 ♂, 5 ♀)
- 10 Pentagonoids (5 ♂, 5 ♀)
- 9 Ovoids (5 ♂, 4 ♀)
- 2 Spheroids (1 ♂, 1 ♀)

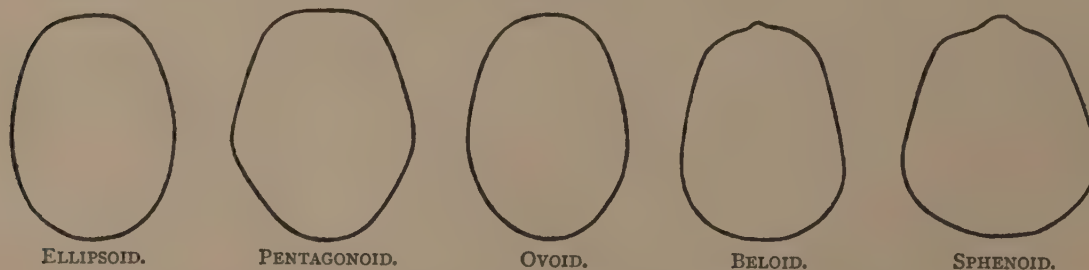
Total 34

And in *Group II* there are:

- 25 Ellipsoids (14 ♂, 11 ♀)
- 8 Pentagonoids (3 ♂, 5 ♀)
- 19 Ovoids (17 ♂, 2 ♀)
- 3 Beloids (2 ♂, 1 ♀)
- 4 Sphenoids (all ♀)

Total 59

To assist the reader to understand the Sergian classification outlines are here appended of the chief types referred to above.



So that if we compare the results obtained by Professor Sergi's methods on the one hand, and by our own analysis on the other, it is evident that his method gives only

¹ *Africa*, p. 391.

a slight hint of the remarkable contrasts which our analysis has revealed between the specimens composing the two respective groups.

In the main no doubt this is due to the fact that the essential contrasts between the groups are based primarily on their facial and not on their cranial features, whereas it is with the cranial form that Professor Sergi's system is mainly concerned¹.

His classification, however, does seem to bring out certain points of importance when the different *periods* are compared together. Thus it can be seen from the digest in Table XIII, which includes not only the members of our two groups but also all intermediates and hybrids as well as a certain number of isolated unpublished specimens, that there are striking differences between the various periods. In the Early Predynastic time the Ellipsoids compose 48½ per cent. of the series, but in the New Empire (i. e. the several series of the Eighteenth Dynasty and those of the Thirtieth) they are barely 22 per cent.; the Ovoids and Pentagonoids are relatively more numerous in the latest than in the earliest period, and the 'Eurasian' forms which occur at most twice in the whole archaic period, apart from the Royal Tombs, are represented by several specimens in the Royal Tombs and in the subsequent periods². The subjoined table will make this and other points of the same kind clearer.

Comparison of a classification on Prof. Sergi's system with the results obtained by other methods.

TABLE XII.

	<i>Ellipsoids.</i>	<i>Pentagonoids.</i>	<i>Ovoids.</i>	<i>Beloids.</i>	<i>Rhomboids.</i>	<i>Sphenoids.</i>	<i>Platycephalus.</i>	<i>Cuboids.</i>	<i>Absolute Number of Specimens.</i>
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Early Predynastic	48.5	21.5	19	5.5	...	2.5	...	2.5	37
Late Predynastic	56.5	21.5	21.5	...	...	...	...	...	37
First Dynasty	62	24	14	...	...	...	...	...	29
Royal Tombs of First and Second Dynasties	44.5	18.5	23½	8	...	10.5	...	...	38
Third and Fourth Dynasties from Regagnah	20	7	46.5	7	...	20	...	...	15
Eighteenth and Thirtieth Dynasties	22	29	31	3.5	.5	9	4	...	55

Now so far as this is equivalent to saying that the periods after the archaic exhibit less dolichocephaly the results are no more than would have been obtained by the ordinary methods of the cephalic index, and indeed they are fully in accord with what has already been found by those methods. But it must be admitted that there is a distinct gain in precision, and that the Sergian classification here brings out details in the relative composition of the several series which might have been obscured if only lists of indices had been employed, and would certainly have been lost if the tabulation had been

¹ We are fully aware that Professor Sergi has emphasized the importance of facial features and has attempted to classify the contours of the face in the same way as those of the skull. The attempt, however, has been far less successful, and it is not without reason that most anthropologists have confined their attention to his *cranial* forms. And in any case there is a special difficulty in applying such a classification on any considerable scale to the specimens in museums from which the lower jaw is so frequently absent.

² There has been some artificial selection in the formation of the series of Eighteenth Dynasty photographs which ought to be stated, though it is so slight that it can hardly have affected the results to any appreciable extent. It applies only to the specimens marked with the letter J. These were photographed in the field at Abydos, and, as it was impossible to photograph every specimen found, such a selection was made as would comprise all the various forms. In the J series therefore it is possible that the forms of most common occurrence, whatever they may be, are somewhat under-represented. But of course this has nothing to do with the fact that in the earliest periods the sphenoidal and similar forms are almost absent.

Advantages
which may
sometimes
result from
the employ-
ment of Prof.
Sergi's
system.

confined to the mere averages of indices. We may illustrate in this connexion the nature of the conclusions to which the Sergian system may sometimes lead by a reference to the classification of the Egyptian skulls in the Naples Museum. Professor Sergi found (*Africa*, pp. 50-64) that out of the 86 specimens forming the collection no less than 21 were of the single form which he styled at that time 'Sphenoides aegyptiacus' and which he now calls 'Beloides aegyptiacus.' This is a striking example of the employment of his classification, for much more information is conveyed by the statement that these 21 skulls are all of exactly the same shape than would be given by the mere publication of their several cephalic indices. The review of the Naples collection is further interesting as corroborating the opinion that forms divergent from the Ellipsoidal and Ovoidal are commoner in the later than in the earlier periods, for the collection, whatever its precise composition may be, can hardly include any Predynastic skulls, inasmuch as no archaic cemeteries had been explored at the time when it was formed.

TABLE XIII.

Early Predynastic	Late Predynastic	First Dynasty	Royal Tombs of First and Second Dynasties	Third and Fourth Dynasties from Regagnah	XVIIIth Dynasty (J, K) and XXXth Dynasty (L)	XVIIIth Dynasty (isolated specimens forming no series)
ELLIPSOIDES						
africus sphyroides	♂ 3, 37, 219 ♀ 22, 28, 30	♂ 145, 183, 209 ♀ 148, 170	♂ 513 ♀ 504	♂ 406, 420 ♀ 437 sex ? 422, 424, 431	...	...
cuneatus	♂ 11 ♀ 10	♂ 137, 205, 211 ♀ 162	♂ 511 ♀ 82, 88, 90 ♀ 514	♂ 425 sex ? 435 ♀ 432 sex ? 445	♂ K 11, K 69 ♀ K 84	♂ 2005 ♀ 2502
cylindricus	...	(p. cuneatus) ♀ 128	...	...	...	...
declivis	♂ 7, 199, 181 ♀ 32, 142, 254	♂ 117, 125, 155, ♀ 112, 164, 175, 213, 253 ♀ 166	♂ 63, 67, 83, 159, ♀ 58, 154, 517 ♀ 516	♂ 409, 412, 415, ♀ 428, 440 419, 421	♂ J 17, J 45, J 65 ♀ L 6, L 14	...
emboliceus	♂ 9 ♀ 168, 174	...	...	♂ 606	...	...
parallelus	(Total of Ellipsoides, 18)	(Total of Ellipsoides, 21)	(Total of Ellipsoides, 18)	(Total of Ellipsoides, 17)	(Total of Ellipsoides, 3)	(Total of Ellipsoides, 9)
rotundus	...	...	...	...	...	...
sphyroides	...	...	...	...	...	...
PENTAGONOIDES						
acutus	♂ 139 ♀ 14, 18, 20, 26	♂ 135 ♀ 118, 150	...	♂ 408, 418 ♀ 407	♂ J 25, J 35, K 17 ♀ J 32	♂ 2010, 2507, and another
acutus brevis	...	...	...	...	♂ K 79 ♀ J 54	...
acutus latus	...	...	...	...	♂ J 41	...
acutus subtilis	...	♂ 141, 153	...	...	♂ J 48	♂ 2006
obtusius	♂ 5, 15 ♀ 8	♂ 115 ♀ 138, 156	...	♂ 413 sex ? 429 ♀ 413	♂ J 70, J 76	♂ 2003 and another
subtilis	(Total of Pentagonoides, 8)	(Total of Pentagonoides, 8)	(Total of Pentagonoides, 6)	(Total of Pentagonoides, 5)	(Total of Pentagonoides, 1)	(Total of Pentagonoides, 10)
OVIDES						
byrsoides	...	...	♂ 59	♂ 436 ♀ 410	...	one unnumbered ♀ 2008
brevifrons	...	...	...	...	♂ J 93	...
cuneatus	♂ 255 ♀ 178	♂ 127 ♀ 86	...	♂ 601	♂ J 77	...
declivis	...	...	...	...	♂ J 13, J 55, K 47	♂ 2504
depressus	...	...	...	...	♂ J 87	...
isocampylus	♂ 1, 35 ♀ 44	...	...	sex ? 416 ♀ 426	...	...
largissimus	...	...	...	...	♂ K 73	...
latus	♂ 25 ♀ 176	♂ 133, 167 ♀ 146	...	♂ 430 sex ? 433 ♀ 403	♂ J 9, J 21, J 28, ♀ J 106	♀ 2007
planus	♂ 207, 217	...	...	♂ 402	...	...
rotundus	...	...	...	♂ 405	♂ 612, 616 ♀ 613	...
subtilis	...	...	...	...	♂ 615, 618	...
sphyroides	...	...	...	...	♂ 619	...
trapezius	...	♀ 250, 252, 256	...	...	...	...
(Total of Ovoides, 7)	(Total of Ovoides, 8)	(Total of Ovoides, 4)	(Total of Ovoides, 9)	(Total of Ovoides, 7)	(Total of Ovoides, 13)	(Total of Ovoides, 4)
BELOIDES						
aegyptiacus	♂ 6	...	...	sex ? 434, 446	♂ L 7 ♀ J 108	...
lybicus	♂ 48	...	...	♂ 417	...	...
(Total of Beloides, 2)	(Total of Beloides, 0)	(Total of Beloides, 0)	(Total of Beloides, 3)	(Total of Beloides, 1)	(Total of Beloides, 2)	...
RHOMBOIDES						
...	...	...	...	...	♂ J 29	...
(Total of Rhomboides, 1)	...	...	...	...	(Total of Rhomboides, 1)	...
CUBOIDES?						
♂ 189	...	...	...	...	...	...
(Total of Cuboides, 1)	...	...	...	...	...	...
SPHENOIDES						
rotundus	♂ 123	...	...	♂ 414, 427 ♀ 411, 423	♂ K 77 ♀ K 58, K 80	♂ 2009
rot. parvus	...	...	...	...	♀ J 26	...
(Total of Sphenoides, 1)	(Total of Sphenoides, 0)	(Total of Sphenoides, 0)	(Total of Sphenoides, 4)	(Total of Sphenoides, 3)	(Total of Sphenoides, 4)	(Total of Sphenoides, 1)
PLATYCEPHALUS						
quadratus	...	...	...	...	♂ J 49 ♀ J 4	...
orbicularis	...	...	...	...	...	...
(Total of Platycephalus, 2)	...	...	...	...	...	...

CLASSIFICATION ACCORDING TO PROF. G. SERGI'S SYSTEM OF THE SKULLS OF WHICH PHOTOGRAPHS WERE AVAILABLE.

CHAPTER VII

THE GENERAL THEORY OF THE MATHEMATICAL TREATMENT OF SERIES

THE merit of having demonstrated that the theory of probabilities was applicable to series of numbers in general belongs to Quetelet, the distinguished Belgian mathematician.

The demonstration that the theory of probabilities is applicable to statistics in general is due to Quetelet.

In a series of letters dedicated to Ernest II, the then Duke of Saxe-Coburg-Gotha *, he explained the entire theory in detail. He showed how it could be used in Anthropometry as well as in Astronomy and Physics and similar sciences. Since his time the methods and details have been altered, and much has been added by later writers to the structure of which Quetelet laid the foundation.

The main point about the theory is that, under normal circumstances, the results of a number of observations, or a number of examples in a series, can be arranged in such a manner as to form a group arranged symmetrically and in a definite form about one particular centre.

The theory is that a number of observations or a number of examples in a series will group themselves symmetrically about a centre. The foundation of the theory is given by the observed facts of ordinary experience, and can be expressed by certain mathematical forms.

The foundation on which the theory of probability is built is common experience. The examples necessary to show its development are taken from everyday life, and its application to series of calculations may be reduced to a comparatively simple procedure. The necessary rules do not involve complicated reasoning, but recently the subject has become one of great interest to expert mathematicians who have developed it in many directions. As Mathematics this work is, much of it, of great interest, and some of it is applicable to certain branches of Natural Science.

In its highest form it is to be found in Professor Karl Pearson's papers in the *Phil. Trans.* on 'The Application of Mathematics to Evolution,' and in the work of his collaborators. It is impossible, however, to expect the working anthropologist to follow the intricacies of this work, and it is unnecessary for him to do so.

It is intended to give here a statement of such rules as are necessary in the simplest possible form.

The 'chance' of drawing the ace of spades from a pack of cards is $\frac{1}{52}$, and the 'odds' against drawing it are 51 to 1. For it is possible to draw the ace of spades in only one way, whereas it is possible to draw some other card in 51 ways. The total number of ways of drawing a card is, of course, 52, which is the sum of the other two numbers.

Simple example explaining a few of the necessary terms.

If we are given any set of circumstances we sometimes know that only one result is possible: more often a larger number of results may occur. Suppose the circumstances are such that the result arrived at can occur in a number, n , of different ways, and that each one of these n ways is equally likely to happen. If, in addition, one particular result would occur in a number, m , of these n ways, and consequently would fail to occur in $n - m$ ways,

More general application.

the 'chance' of the event, or its probability of occurrence, is defined as $\frac{m}{n}$. The probability of its non-occurrence is similarly $\frac{n - m}{n}$. If we denote $\frac{m}{n}$ by p and $\frac{n - m}{n}$ by q , p and

* *Lettres sur la Théorie des Probabilités* (Bruxelles, 1846).

More
general
application.

q are respectively the chances that the event will, and will not, occur. As the event must do one or the other $p + q = 1$ denotes certainty. The odds in favour of the event are m to $n - m$, those against are $n - m$ to m . In the example already given $m = 1$, $n - m = 51$, $n = 52$: so $p = \frac{1}{52}$ is the chance of drawing the ace of spades, and $q = \frac{51}{52}$ is the chance of not drawing it. The odds against this event are 51 to 1*.

The series
that are
given in
Anthro-
pometry are
analogous
to simple
events.

In Anthropometrical Series the 'events' are clearly independent, for one skull cannot influence another so as to affect its measurements. We may therefore confine our attention to independent events. The series we consider are simple combinations of independent events, and are exactly analogous to such series as may be obtained by repeating any operation a number of times.

The operation which we take for comparison is that of placing a number of pennies at random on a table. The *a priori* chance of any particular penny turning up 'heads' is the same as its *a priori* chance of turning up 'tails.' In the same way in such series as those with which we are now dealing, errors in observation, or deviations from a type, are generally assumed, in the absence of any specially noted causes of disturbance, to tend equally to excess and deficiency (on this point see Chap. VIII, opening paragraphs). This, as will be shown later, much simplifies the formulae which we use and the methods by which we arrive at them.

Introduction
of a few
necessary
algebraic
symbols.

There are a few algebraic* symbols necessary in the study of the theory which it will be convenient to introduce here. Suppose we have a number, n , of pennies. Then if we take t of them, where t is any number not greater than n , we denote by nC_t the number of ways in which it is possible to pick up t pennies out of the n : e.g. if there are three pennies (that is to say $n = 3$) we can pick up two of them in three ways: that is to say, if $t = 2$, nC_t is 3. The number of ways in which the three pennies can be placed on the table is eight, as any reader can verify for himself. Each of these eight occurrences is of equal probability, and consequently the chance that, on placing the pennies on the table, two of them shall be heads uppermost is $\frac{3}{8}$.

The principle can be extended to any number of pennies; the fraction which denotes the chance of t out of n pennies being heads uppermost will have for its numerator the expression nC_t and for its denominator 2^n . In the case which we have quoted for an example nC_t is 3 and 2^n is 8†.

* The examples here given are illustrative of simple events which are independent of one another. When, however, an event is dependent upon the occurrence or non-occurrence of some other event the rule is naturally more complex. It may be epitomized in the following form:—If p_1 is the chance of one event and p_2 is the chance of a second event subsequent to the first, then the chance that the two will happen successively and in the prescribed order is $p_1 \times p_2$.

For instance, what is the probability that the ace of spades will be drawn from a pack of cards and that the next card to be drawn will be the ace of hearts? From the application of the rule it will be evident that as the chance of drawing the ace of spades to begin with was $\frac{1}{52}$, and the chance of drawing the ace of hearts from the pack diminished by one card was $\frac{1}{51}$, the chance of the double event is $\frac{1}{52} \times \frac{1}{51}$.

Such complex occurrences, however, are not amongst the problems which are dealt with in our present investigation.

† The case in which the chances are unequal *a priori* may be treated in the same manner, but the reasoning is more complicated.

A convenient example of this is to be found in dice-throwing. Here the chance of throwing a six with one die is $\frac{1}{6}$ and the chance against $\frac{5}{6}$. It can be shown by the same methods as those hinted at above that the chance of throwing t sixes with n dice is $\frac{{}^nC_t}{6^n} 5^{n-t}$.

In cases analogous to the above where the number of pennies is small it is a comparatively simple matter to calculate the probabilities of a given occurrence by arithmetic, but for the long series which commonly occur in statistics a less clumsy method is needful, and one moreover which can be applied to series even when the numerical values of n and t are unknown. Such a method is supplied with the help of the Binomial Theorem.

More general application.

This theorem deals with the expansion of a certain algebraical expression in a series of terms, and the law according to which these terms are calculated is intimately connected with the Law of Probability.

The Binomial Theorem in its relation to Probability.

The part of this theorem with which we are directly concerned is that in which it deals with the expansion in a series of terms of an expression such as $a+x$, where that expression is multiplied by itself a certain number of times, say n .

For the moment we may still further simplify matters by using the number one in the place of a . We have, then, under consideration the expression which results from the expansion into a series of $(1+x)^n$. The resulting series is one composed of a number of terms, each consisting of a power of x multiplied by a constant which varies with the power of x considered. If, for example, $n=3$ we have $(1+x)^3 = 1 + 3x + 3x^2 + x^3$. The constant connected with x^t , or the t^{th} power of x , is what we have already denoted by nC_t .

Consequently the chance of any particular number of heads occurring in our experiment is the same as the coefficient of the corresponding power of x in the expansion of $\frac{(1+x)^n}{2^n}$, e.g. the chance of two of three pennies showing heads is the coefficient of x^2 in $\frac{(1+x)^3}{2^3}$, and so is $\frac{3}{8}$ as already shown.

In the expansion of $(1+x)^n$ the coefficients form a gradual progression rising from the lowest values at the beginning until the middle term, if n is even, or the two middle terms, if n is odd, where the coefficients have their maximum value. From this point the coefficients begin to decrease steadily, and the terms at equal distances on either side of the middle term or terms have equal coefficients. This may be seen in any particular example as, for instance, where $n=3$, as shown above, or where $n=6$ when

Properties of the coefficients in the expansion of $(1+x)^n$.

$$(1+x)^6 = 1 + 6x + 15x^2 + 20x^3 + 15x^4 + 6x^5 + x^6.$$

In the general case nC_t , i. e. the coefficient of x^t in the expansion of $(1+x)^n$, may be expressed as a fraction, the numerator of which consists of the product of t factors differing from one another by unity and ranging from $n-t+1$ to n , and the denominator consists of the product of the first t numbers. Thus nC_t stands for

$$\frac{n(n-1)(n-2)\cdots(n-t+1)}{1 \cdot 2 \cdot 3 \cdots t}$$

and

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{1 \cdot 2}x^2 + \cdots + \frac{n(n-1)}{1 \cdot 2}x^{n-2} + nx^{n-1} + x^n.$$

To show this more clearly we may take Quetelet's example in which $n=999$. The first coefficient is 1, the second 999, the third $\frac{999 \times 998}{1 \times 2}$, and so on to the highest point, which is reached in the 500th and 501st terms, which are equal, being respectively

$$\frac{999 \cdot 998 \cdot 997 \cdots (999 - 499 + 1)}{1 \cdot 2 \cdot 3 \cdots 499}$$

and

$$\frac{999 \cdot 998 \cdot 997 \cdots (999 - 498) (999 - 500 + 1)}{1 \cdot 2 \cdot 3 \cdots 499 \cdot 500}.$$

The summit is obtained with these terms and the descent begins with the 502nd term, of which the coefficient has the same value as that of the 499th.

Application
of graphic
representa-
tion.

To overcome the inconvenience of using lists of the numerical coefficients Quetelet's device of a graphic form has been very generally adopted. From what has now been said it can readily be understood that if 'ordinates' which are proportional to the coefficients in the binomial expansion are drawn at equal intervals from one another perpendicular to a horizontal base, such ordinates will represent the probability that a corresponding number of heads or tails will occur in a series of 2^n trials. Quetelet illustrates the case from betting, and asks his pupil to suppose piles of coins to be placed in a row like the ordinates; the varying height of these piles will represent the mathematically reasonable betting on the occurrence of the various events.

The figure (Fig. 10) indicates this in the case of four pennies placed on a table, the ordinates representing the chances of the particular events indicated, or the number of sovereigns which the pupil might reasonably bet on these events.

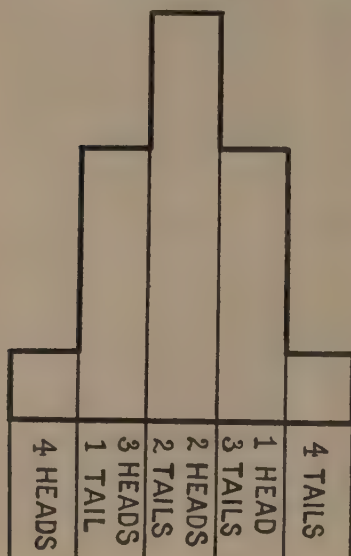


Fig. 10.

able event in a series of events, or the most probable observation in a series of observations. And the height of any ordinate will represent (on a scale to be determined later) the chance that the event or observation represented by this ordinate should occur.

Quetelet's famous instance of the graphic curve was derived from observations on the chest-measurements of Scotch soldiers, and even now this forms a model for his successors.

The diagram given below is that of a binomial curve and is taken from Quetelet's

On this graphic system if the number of trials is very large and the ordinates are placed close together the lines uniting their tops will form a continuous curve. According as n is increased this curve tends to assume a more and more definite outline. In its perfect form it is named the 'Curve of Error' or the 'Probability Curve.'

The perfect form is given by the expansion of $(1+x)$ to infinity, but as a matter of fact when n is very much less than infinity, and is merely a large number, the approximation to the perfect curve is almost complete.

When the number of objects under observation (corresponding to the pennies) (n) is as great as 999 the curve differs in a quite inappreciable degree from the perfect curve (in which $n = \text{infinity}$); and indeed when the number of objects is even as low as thirty-two the difference of the resulting curve from the perfect curve is very slight. The apex of the curve will therefore represent the most probable

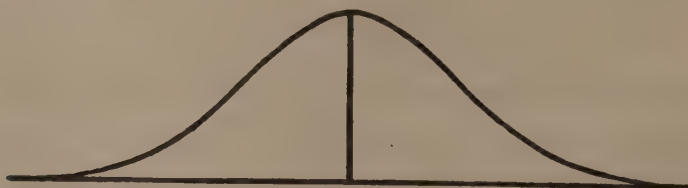


Fig. 11.

figures. In view of the language of certain writers on this subject it must be pointed out that there is no standard curve of error, just as there is no standard ellipse.

For the purposes of the present work, in which it was essential to be able to compare the actual curves of frequency with the theoretical curves of probability, the diagrams have not been drawn in the way here shown but in block form. Each block then is like a pile of sovereigns in the illustration of gaming which was employed above. Thus the curve given above in the form of a true curve will appear in block form as shown in Fig. 12*.

Application of graphic representation.

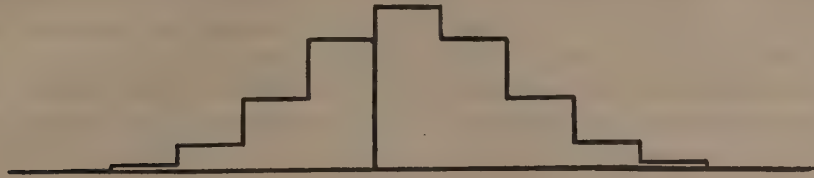


Fig. 12.

Suppose then that the experiments have been made as in the example already given of taking coins and placing them on a table: other things being equal, each coin is equally as likely to turn up heads as tails, and if 999 are taken the most probable occurrences are 499 or 500 heads and 500 or 499 tails. That the number of heads will be 498 or 501 is slightly less probable, and the probability of a greater disproportion between the number of heads and tails rapidly decreases until it would take a decimal with an enormous number of noughts to express the almost impossible contingency of the 999 coins showing all heads or all tails.

Illustration of how the binomial curve expresses probabilities.

This scale of relative probability is shown by the two sides of the curve: one side exhibits the deficiency below, and the other the excess above, the mean, that is to say, in the present case, a number of tails greater than the number of heads, and vice versa. If the nature of the experiment be changed, and the series to be expressed is that of a number of observations made by different persons upon the same phenomenon or the same object, then the curve shows the varying degrees of accuracy to be expected from such observations. The apex of the curve shows the highest probability, that is to say, it gives the result obtained by a larger number of observers than obtain any other result, and this result may be presumed to correspond closely to the truth. The points of the curve just on either side of the apex exhibit the next greatest probability, that is to say, they show that a large number of observers, though not so large a number as before, will always make a slight error either of excess or of defect. The slope of the curve on either side shows that as the size of the blunder increases the number of observers making that blunder decreases, and only an exceedingly small number of observers will make a gross error either of over- or of under-estimation.

Any series of observations upon a single phenomenon made by a number of persons will illustrate the truth of this theorem. Quetelet's well-known example is taken from 487 observations upon the ascension of the polar star as made by the astronomers at Greenwich. It was found that eighty-two observers obtained identical results, seventy-two obtained results slightly in excess, and seventy-three obtained results slightly in defect, of the standard obtained by the majority, and so on with decreasing frequency until only a quite small proportion of persons was found who recorded an observation very greatly in excess or very greatly in defect, the normal standard being typified by the apex of the curve.

* The appearance of the curve differs slightly according to the ratio between the units taken in measuring lengths and heights and also according to the position taken for the mean line; v. Appendix, Note I, p. 125.

Illustration
of how the
binomial
curve
expresses
probabilities.

The case is practically the same if we substitute in the place of a number of observers working on a single object one single observer working on a number of objects which may, or may not, be grouped in a definite series, such as a series of anthropometrical measurements. It may be objected that anthropometrical work is done by very many persons and therefore there is a double complexity of chances, viz. the chances of variation in the objects observed and the chances of error in the individual observers. This objection, however, is little more than academic. The processes of measurement are very simple, the points to be measured are well understood, and though (as our last example sufficiently demonstrates) there certainly will always be slight variations between the results obtained by one anthropologist and those obtained by another on the same specimens, or even between those obtained by the same anthropologist at different times, yet these variations in the case of even moderately skilled workers are so infinitesimal compared with the variations between different specimens that they may be neglected with impunity. The most perfect land-survey ever made cannot approach in accuracy the work of the optician, but it would be pedantry to deny its accuracy on that account.

In the measurements taken for this work it is very unlikely that even a single observation will be so far out as to assign the object under consideration to a class different from that in which it ought to be put.

Relation
between
Curves of
Probability
and Curves
of Fre-
quency.

It is evident, therefore, that when a number of observers are at work making observations upon a single object the curve in which their results may be arranged according to their relative frequency is a measure of the accuracy with which the observers themselves conducted their work. On the other hand, when a single observer is at work on a number of objects the curve in which the results are expressed is not a curve of the accuracy of the observations, for we have already shown that for our purposes the lapses from absolute accuracy may be neglected: this curve represents the degree of homogeneity of the objects with which the observer is dealing. In the one case the agreement of the errors of the observers with those forecast by theory, in the other the homogeneity of the objects, is estimated by the degree in which the curve representing the actual results approximates to the form of the perfect binomial curve. The curve which represents the actual results may be conveniently styled a Curve of Frequency, the true 'binomial' curve being usually known as the Curve of Probability. It is of the greatest importance that the reader should clearly understand at the outset the distinction between the two. The Curve of Frequency is a graphic representation of the actual results got by the observation of a series of examples, and is obtained by grouping these results in a definite orderly sequence from the lowest to the highest value obtained or vice versa along the scale that is being used. The units of measurement on this scale are, at the outset, quite arbitrary, and may represent millimetres or numbers of millimetres, grammes or numbers of grammes, or whatever may be most suitable. The Curve of Probability is that which would have been obtained in the same manner and on the same scale if the observations had strictly conformed to the Law of Errors.

It has already been explained that with certain sets of observations, if the number is sufficient to form an adequate series, the Curve of Frequency and the Curve of Probability will coincide. In anthropometrical series, as has been shown over and over again, the same thing will happen if, and only if, the series of examples is approximately homogeneous: in that case the apex of the curve shows the type to which the largest number of similar specimens conform in respect of the particular characteristic under consideration.

In other words, the apex of the curve gives the type while the sides show the

deviation from the type, these deviations being such as the law of errors leads us to expect in a homogeneous series. By the Law of Errors such deviations should be perfectly regular and equal in number alike on the sides of excess and defect. If they are so the Curves of Probability and of Frequency will coincide exactly. Generally, however, the two curves deviate from one another to a greater or less degree. If they differ considerably in their contour then, either the number of objects under observation is insufficient to represent adequately the true character of the series, or else the series itself is composed of heterogeneous elements. The two following figures may serve to illustrate Curves of Frequency which (Fig. 13) conform fairly closely to and (Fig. 14) diverge widely from the requirements of the Law of Errors.

Relation between Curves of Probability and Curves of Frequency.

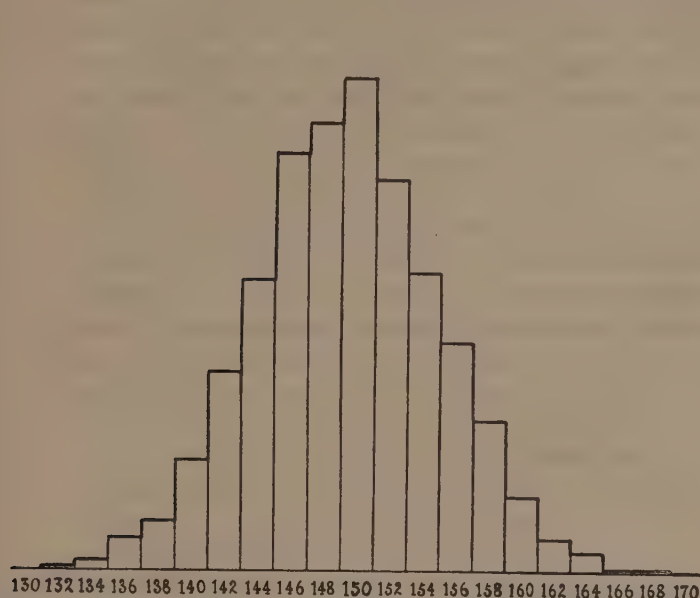


Fig. 13. Frequency Curve of face-breadth of full-blood American Indians. After Boas, *Zeitschrift für Ethn.* xxvii, p. 405.

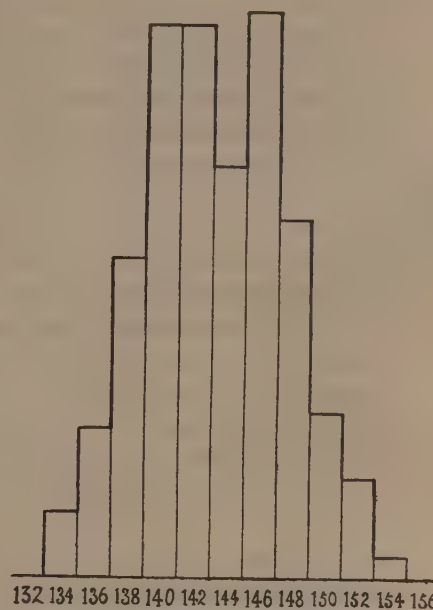


Fig. 14. Frequency Curve of face-breadth of half-blood American Indians. After Boas, *Zeitschrift für Ethn.* xxvii, p. 407.

To estimate the homogeneity or otherwise of a series, it is necessary, therefore, to compare the two curves.

It has been said that the Curve of Probability may be obtained directly from the Binomial Theorem. It is obvious, however, that though it will always be perfectly symmetrical and of a definite appearance, just as all ellipses may be said to have a definite form, still the slope of the curve and its size will vary according to the units of measurement taken for lengths and heights. Any one Curve of Probability can by suitable transformations be reduced so as to coincide with any other, just as this same process can be gone through with ellipses. The necessity of this may be made apparent to the anthropologist by considering the variations in the orbital index as compared with those in the vertical index. These latter vary over a much smaller range than do the former. Consequently some sort of reduction is needed to bring them to a common measure. The method used in this work is foreshadowed above, but there is another method. In this method, which we do not make use of, the Curve of Probability is made to take a standard form, which form is that given above in Fig. 11 (see also

Method of reducing the Curve of Probability to the scale of any Curve of Frequency.

Method of reducing the Curve of Probability to the scale of any Curve of Frequency.

Appendix, Note II, p. 125). If this standard is generally used it will be necessary to alter the units of measurement in each Curve of Frequency, so that if the observations did fit the Law of Errors the Curves of Frequency and Probability would coincide.

Such a method has the advantage that the form of the curve is always the same and can be easily retained in the pictorial imagination. The calculations involved are, however, so exceedingly laborious, that this method of procedure is impracticable when the number of series is as large as in the present case.

An equally efficacious and much less laborious method is that of reducing the Curve of Probability to the standard of the Frequency Curve instead of vice versa. For the method by which this is done see Appendix (Note III, p. 126).

This is the procedure which has been adopted throughout in the diagrams representing Frequency Curves and Probability Curves, which are reproduced in the supplement to this volume. Every separate series consequently has *its own* particular Curve of Probability, and it is from the gradient of *that* curve alone that any information can be obtained.

Criteria by which the homogeneity of a curve is to be judged.

The criteria by which the homogeneity of the series must be judged are of two kinds, viz. :—

1. Those depending directly on graphic representation; viz. the extent of the coincidence or divergence of the two curves, that of Frequency and that of Probability, and the place or places where the divergences occur.

2. The more subtle characteristics of the curves, which are not readily appreciated by the eye and are therefore more conveniently expressed by mathematical symbols and formulae.

It is now necessary to give a brief description of these symbols for the sake of those readers who are not practised in this style of work.

A , M , R , r , η , c , are the symbols which are used in the diagrams given in the Supplement.

Of these A is the area of either the Curve of Probability or that of Frequency, i. e. it is the number of specimens in the series under consideration.

M is the arithmetical mean of the series. R is the measure of the oscillation or instability of that mean. r is the 'probable error' of the series. η is the average error of the specimens.

c is the modulus of the curve and serves to determine its shape in conjunction with $\frac{A}{c\sqrt{\pi}}$, which represents the number of specimens which in the Probability Curve would occur at the mean.

In the Appendix (Note IV, p. 128) is given an example of the working out of these values for a particular series which will show exactly how each of them is obtained. We may now proceed to show their application and incidentally to illustrate how they are obtained.

Two main elements in any series.

In judging of the nature of any given series for which a Probability Curve has been constructed there are two main elements of which the stability must be estimated, viz. :—

1. The series itself in relation to its own standard or type.
2. The standard or type itself.

1. The consistency of the series in relation to its standard or type may be judged according to either of two methods, the important symbols of which are named respectively

the 'error of mean square' (or the 'standard deviation' as it is generally called by biometricians) and the 'probable error'; the latter only is used in this volume*.

Two main elements in any series.

The probable error, r , gives the units within which half the examples in the whole series occur. That is to say, r is the quantity which, if added to M on the one side and subtracted from M on the other side, accounts for half the individuals in the series. It is evident therefore that the largeness or smallness of the value of r gives immediately an approximate idea of the compactness of a series or its reverse. Consequently it is most useful in cases of comparison. Suppose, for example, that M and r have been determined for a series made up of several smaller series, then, if in any one of the component series it is found that the proportion of examples lying between the limits of $M \pm r$ is not nearly an exact half, the amount of the variation will show the extent to which the elements forming that component series differ from the predominant type in the compound series.

2. The second element of which the stability must be estimated is that of the type itself, the standard from which the other individuals deviate. This is the pivot on which the whole turns, as a balance upon its axis. If the axis itself is unsteady, the balance itself must be doubly unsteady as it adds the elements of its own instability to those of the axis. Suppose that the type itself cannot be fixed at all closely, but varies within the limits of, say, several units along the base of the Frequency Curve; then, as a natural consequence, the measurement of the deviation of any individual observation from the type is uncertain to exactly the same degree. The type, as previously stated, is given by the apex of the curve. In a pure curve, as in the Curve of Probability itself, the apex is unmistakably defined, and is in the same position as the arithmetical mean. In an impure curve, however, the apex is ill-defined or perhaps there may be more than one apparent apex. The difficulty then arises as to the point at which the type may really be said to be found, e.g. in the impure curve in Fig. 14 it might be said that the type was at 140 or at 146 or even at some point between them.

The stability of the type itself is judged by the nearness of its approach to identity with the arithmetical mean. As a matter of fact the outline of the Frequency Curve always shows fairly clearly whether the type varies within wide limits or not. For purposes of comparison, however, it is useful to have a mathematical expression for this variation. This may be obtained in the following way. The arithmetical mean of the series under consideration is first calculated: this is, of course, obtained by adding together all the individual values and dividing the result by their number: this is symbolized by M . We next calculate η , which, as we have seen, is done by adding together all the differences of the individual values from M , leaving out of account the plus or minus sign of these differences: dividing this result by the number of examples in the series we arrive at the formula $\eta = \frac{\sum \delta}{n}$. From this we obtain the probable error r by multiplying η by the constant number .8453.

We now proceed further to the application of this work to determine the stability of the type. We divide the value of r so found by the square root of the number of

* The error of mean square, or the standard deviation, symbolized by ϵ , is obtained as follows. Suppose there are n observations in a series, let M stand for the arithmetical mean, δ for the difference of any individual from the mean. Then, Σ denoting summation for all the individual cases, ϵ^2 is defined by the formula $\epsilon^2 = \frac{\Sigma \delta^2}{n}$.

Two main elements in any series.

examples in the series giving a quantity R which $= \frac{r}{\sqrt{n}}$. This quantity R represents the limits within which the probable value of the mean M may vary. M of course is determined absolutely by our series, but a conceivable addition of a few examples might alter it to a greater or less degree. R is a measure of the degree to which this variation is likely to occur, and the value of the mean should be put down as $M \pm R$. R will never be large, but its variation will indicate the reliability of the value found for M .

The measure of the utility of mathematical formulae.

R , then, is in itself a measure of the stability of the type, while r serves to indicate the conformity of the general series to that type.

In the preceding paragraphs and in the notes in the Appendix we have given the simplest mathematical formulae for testing the goodness of fit between a Frequency Curve and the corresponding Probability Curve. These formulae are of most use when considerations of space or convenience preclude the reproduction of the actual graphic curves. In the present work, however, it has been found practicable to reproduce the Curves of Frequency in such a way that the inferences to be drawn from them can be at once pointed out. Consequently, although the results derived from the mathematical formulae are also published it was not really necessary to do so. They merely serve as aids and corroborations. There is nothing recondite hidden under these cryptic symbols, a fact which will, it is hoped, be appreciated by the attentive reader. When the two Curves, that of Probability and that of Frequency, are given side by side it is perfectly easy to judge of the misfit by eye, especially when, as in the present case, mechanical aid is given to the eye by the way in which the curves are plotted. Accordingly we have employed squared paper and have drawn the Probability Curve and the Frequency Curve together. They enclose the same area, viz. the number of squares equal to the number of examples in each particular series.

To obtain the precise amount of the misfit therefore it is only necessary to reckon the area (irrespective of whether it be excess or defect) over which the two curves fail to coincide. The proportion of this to the total area may then be expressed as so much per cent., which will enable us to compare directly the results obtained on series containing different numbers of examples.

An experiment on any one of our figures will make this clear, and the experimenter may convince himself of the accuracy of the result by comparing it with the mathematical expression of the same which is appended in each case.

The method by which the misfit is measured is explained in the Appendix, Note IV, p. 128. The actual method of obtaining the estimate of the misfit except by the graphical method is not given here. A reference may be made to Quetelet's work already cited (*Lettres sur la Théorie des Probabilités*), in which there will be found an explanation of the method and an example of its application. Though lengthy the account is easily intelligible, and as we have only occasionally used the method for purposes of corroboration it is unnecessary to give it here in detail.

Comparison between the utility of mathematical formulae and graphical representation.

It is impossible to give an accurate rule for the application of the values found for the misfit. There values depend not merely on the discrepancies between the two curves, but also on the number of examples in the series, and on the value of the probable error. It may, however, be stated that a small misfit, say under 10 per cent., affords strong evidence of homogeneity. It is probable that with series of under 100 examples a misfit of 20 per cent. should be regarded as small. In the same way large misfits, say over 30 per cent.,

are arguments in favour of heterogeneity, but these tests can only be used to strengthen the evidence derived from other sources.

It has been stated that if the number of observations composing a series is large, e.g. 1000, the contours of the Probability Curve and of the Frequency Curve will approximate very closely to one another and should indeed theoretically coincide. If the coincidence is far from perfect then the series is to be considered as not homogeneous. But a difficulty arises in applying the theory of probabilities to series which are made up of individuals far under 1000 in number, and it is the more important to consider it in this place as the series to be discussed are sometimes comparatively small. It is of course eminently desirable that series which are to be submitted to the test of a Probability Curve should be large, but unfortunately circumstances generally forbid it. If it is justifiable to protest against the efforts which are constantly being made to establish the ethnological position of a people on the evidence of a paltry half-dozen specimens, yet on the other hand it very rarely happens that a series of crania can be obtained which is considerable enough to exclude the possibility of 'random sampling,' that is to say, the fallacious irregularity due to paucity of material. When, however, the series of observations exceeds thirty in number the test of a Probability Curve may be applied if due attention be paid to the checks given by the mathematical formulae, and when the number of observations is over sixty it may be applied with confidence. In our present work the conclusions obtained for one index can be compared with those obtained for another index in the same period; and if the curves for several different features in the same period yield analogous results the argument will be enormously strengthened.

The chances that the curves may fail to fit owing to paucity of material.

If any single Frequency Curve exhibits an outline such as that of the curve on p. 69, Fig. 14, it is clear that its deviation from the theory of probability is enormously greater than can be explained on the mere ground of paucity of material. This is probably true even for series of less than sixty individuals; and if several curves derived from the same set of subjects by means of different properties of those subjects give similar results the evidence becomes exceedingly strong.

Various methods have been suggested for testing whether the deviations in some one particular series may be regarded as the result of random sampling; but there can be no real safeguard so long as only one feature is considered at a time; it is only possible to feel secure when corroborative evidence is given by the other concurrent series.

Two more points must be noted before this chapter is closed. Many anthropologists when making use of Frequency Curves employ one trick or another for regulating their irregularities, and so obtain a smooth curve instead of one with an irregular jagged outline. Such a procedure is under ordinary circumstances totally unjustifiable. The actual statistics obtained by observation ought not to be manipulated in any way so as to alter their value.

The irregularities of the Frequency Curve cannot be smoothed out with impunity.

If this is done the meaning of various parts of the Frequency Curve is disguised if not completely hidden. The 'distribution' of supposed error may well be only the invention of new and very real error. We have already pointed out that the position of a misfit is of great importance in attaching a meaning to it.

This more or less arbitrary smoothing of irregularities may either entirely alter the position of the misfit or even remove it altogether. It would be quite possible, by some of the methods used, to make almost any series of observations fit the Probability Curve very accurately. This is not the object of the application of Mathematics to Anthropology

and kindred sciences. Mathematics must be the handmaid. Unfortunately in some cases it appears to have become the tyrant.

Fallacious
appearance
of purity of
some curves
which are
really
composite.

Lastly, one caution must be given as to the employment of the Probability Curve as a test. From what has been already said it will be understood that when the Probability Curve and the Frequency Curve differ by a large amount there is every reason to suppose that this difference expresses heterogeneity in the series. The converse, however, is not universally true. This is an extremely important point, for it is possible to obtain what appears to be a pure curve by the blending of two or more curves. Sometimes the Resultant Curve will present few points of distinction from a pure curve, but as a general rule this deception is indicated by a skewness in the Composite Curve. The possibility of this arises from the fact that two pure curves may be blended so as to produce varying results according to the relative positions of their mean lines. When these are some distance apart the Resultant Curve will have two apices. As the mean lines approach one another the two apices will merge into one, and a broad-topped curve be the result. When the mean lines approach nearer still this distinctive mark vanishes and, if the Component Curves are of about the same size, the Resultant Curve will appear very like a pure curve. If, however, as generally happens, the two Component Curves differ in size the Resultant Curve will present a skewness towards the larger Component Curve.

CHAPTER VIII

A LIMITED APPLICATION OF THE MATHEMATICAL THEORY TO OUR SERIES.

IN the preceding chapter an account has been given of the general theory of the mathematical treatment of series. It has now to be considered how far this theory can be of assistance for the purposes of the present inquiry. In the first place it must be remarked that Quetelet devoted himself rather to illustrating the employment of the Law of Errors than to actually demonstrating its universal validity. He proceeded upon the assumption that the Law of Errors if applicable to one branch of science would be applicable to all, and the assumption has been acted upon by all those who have since advocated the utilization of such a method in anthropological researches. But although acted upon, the assumption still remains unproved, and even Professor Karl Pearson in his Huxley Lecture¹ admits 'that it is certainly not true for organs and characters in all types of life,' adding further that he would 'be the last to assert that no human characters can be found which do not diverge sensibly from the Gaussian distribution.' 'But,' he says, 'it really does describe in a most remarkable manner the distribution of most characters in mankind.' In evidence of this statement he advances three series of observations, viz. upon the cephalic index of 1982 boys, upon the stature of 1000 women, and upon the head breadth of 3000 criminals. But to our mind these examples are not convincing. There is a possible explanation of their conformity to the Gauss-Laplacian law of errors, which would by no means entail the inference that all other series of observations would be equally amenable. That explanation is in brief that the illustrations selected are taken from series in which the indices or dimensions are of medial character. Thus the cephalic index of the boys ranges from 67 to 92, and the arithmetical mean falls at 78-79, which, as the curve is quite symmetrical, shows that the subjects belong to a *mesati*-cephalic type of mankind. And for this very reason, viz. that the cephalic indices are just those which stand midway in the whole possible range of variation in mankind, there is nothing to prevent the deviations from being distributed equally on either side of the mean. But let it be supposed that not English schoolboys but negroes of a pronounced dolichocephalic type or Mongols of extreme brachycephalic head form had been the subjects of examination. In that case would it have been possible for the swing of the variations to be equal on either side of the mean? The occurrence of extreme forms is necessarily much rarer than the occurrence of those which tend to fall within the medial (i.e. the 'meso') group. Or, to put it in another way, the dolichocephalic stock would tend rather to become less than more dolichocephalic, while on the other hand the brachycephalic stock would vary more in the direction of mesaticephaly than of sphericity. There is a limit at each extremity of the scale of possible variation, and this limit cannot be passed. And yet there are races which stand almost at the respective extremities of the scale, the very dolichocephalic and the very brachycephalic, which

Is it certain that the Law of Errors is applicable to anthropometry?

¹ *Journ. Anthropol. Inst.*, vol. xxxiii, p. 189.

Is it certain that the Law of Errors is applicable to anthropology?

cannot become appreciably more long-headed or appreciably more round-headed. And to superpose a Binomial Curve over the Frequency Curve in these cases would necessitate the assumption that the tendency of such series was to vary equally to either side of their respective arithmetical means. Though this may be theoretically possible it is difficult to conceive it possible in practice. The variation of the long heads would on that hypothesis exhibit specimens with little more breadth than the geometrician's straight line, and that of the broad heads would result in oblongs of which the width was greater than the length. Rather than believe in the possible occurrence of such phenomena, we should suppose that when a series is of such a character that its arithmetical mean is near the extremity of known variation the curve derived from it would be not binomially symmetrical but sensibly askew in outline, that is to say, it would not conform to the normal curve of the Law of Errors.

We cannot then regard it as yet demonstrated that the Law of Errors expresses the distribution of most characters in mankind. We are, however, willing to accept the hypothesis for the moment, pending further inquiry, and to see to what conclusions it may lead.

Assuming that the Law of Errors is applicable to these series, how should they be interpreted?

Quetelet, to recall the details of the last chapter, showed that in a pure series measurements would yield a curve closely approximating to the Binomial Curve, and this brings us at once to the question which underlies the whole statistical treatment, viz. what is a pure series? That is a matter which Quetelet did not fully consider. For him any series is pure which conforms to the principle of the Binomial Curve¹, but he never treated of those which do not so conform. It has been usual to draw the corollary that when a series fails to conform to the Gauss-Laplacian Law it must, in the absence of any peculiar circumstances to explain it, be regarded as impure. But Quetelet did not deal with this aspect of the subject, and therefore did not furnish the necessary criteria for the anthropologist who is desirous of ascertaining whether a curve of measurements represents one race or more than one. Consequently, although the Probability Curve has frequently been used by anthropologists since his day, it has always been handled with considerable uncertainty and misgiving. Of late the subject has been taken up by various highly-skilled mathematicians, who have devised formulae by means of which they claim to interpret the significance of any given curve. Such formulae, however, which are difficult for the layman to master and to handle, give very little assistance in determining the nature and meaning of a variation from the normal distribution unless they are illustrated by the actual graphic representations. On the other hand, mere ocular inspection of a curve will often suggest a clear interpretation, of which the abstruse formulae by themselves give no idea. Thus, in the present instance, a professed biometrician would declare that, judging by his canons, our curves were perfectly consistent with unity of race, but not inconsistent with any one of a dozen other possibilities; yet judged by eye they seem to conform in some cases at least to precisely those conclusions which we have reached by other and independent means. And we would point out that the statisticians themselves do not invariably dispense with empirical treatment. It is unnecessary to go further for an illustration than Professor Karl Pearson's Huxley Lecture for 1903. Amongst the problems with which he was dealing in connexion with the inheritance of mental and moral characteristics, as illustrated by statistics collected from schools, was that of the 'athletic power' of the school-children. But instead of accepting unquestioningly the data in the schedules returned by the teachers as he had done in other cases, he thought well to

¹ Though it is now known that an apparently regular curve may be really heterogeneous and composed of several irregular curves, see above, p. 74.

exercise his judgment upon this particular point¹. We do not suggest that he may not have been perfectly justified in doing so, but it is evident that such a procedure, legitimate as it may be, vitiates the claim to exactitude which is based solely on the infallibility and necessity of mathematics. It is an admission, in short, of the validity of empirical methods when employed by a properly trained and disciplined intelligence.

In practice we greatly doubt whether the system, which according to its authors is the only safe one to adopt for the elucidation of complex craniological problems, provides so useful an instrument as they represent. In the very simple form explained in the last chapter a mathematical treatment of series may give evidence *corroborative* of the results obtained by other means, but by itself it has proved inadequate to suggest these results. And the employment of the more complicated methods advocated by the biometricians leads to no new developments, but merely confuses the issue. In support of our view we may quote the verdict of Mr. Porter, who has made a complete study of the subject on our behalf for the purposes of the present work. He informs us that 'the erudite and complex development of the subject presents many interesting points judged by the standard of mathematics, and that it may quite conceivably be of use in some branches of biology, but that, in his opinion, the more advanced portions of the subject are absolutely useless for the series which we are considering and the work on which we are at present engaged.'

It may possibly be objected that deficiency of material is a sufficient explanation of the failure of the biometrical methods to produce any conclusive results. But it must be urged that the series from Egypt are as large as any that the craniologist can hope to obtain *so long as he is careful rigidly to distinguish between disparate elements*². If they fail in this instance it is not likely that they will prove of much service in ordinary craniological inquiries, where the amount of material is usually much less in quantity.

That we may not be accused of bias in regard to this matter we have published a complete set of tabulations in the supplement (Charts I and II), where the Curves of Probability are accompanied by such mathematical calculations as will facilitate the work of those who wish to experiment with statistical methods.

We may now proceed to state how far any general conclusions can fairly in our opinion be drawn as to the character of the several series published in the supplement. The reader should have the charts of the supplement before him at this point. There are only four properties of the curves which are of any real importance to the non-mathematical reader. These are the misfit and r which should indicate the homogeneity or heterogeneity of the series, and m and R which represent the prevalent type in the series and the stability of that type.

The first question to be approached is that of the homogeneity or heterogeneity of series. A review of the first few periods will enable us to decide how it should be treated. An important point is brought out by the diagram of the cephalic index for the males of the Fourth and Fifth Dynasties (Chart I E, Fig. 1), viz. that misfit alone is an insufficient criterion of homogeneity. In that diagram the misfit amounts to as much as 46 per cent., which *prima facie* might seem to be strong evidence of the impurity of the series. But

¹ *Journ. Anthropol. Inst.*, vol. xxxiii, p. 199. 'An examination of the schedules led me at once to the conclusion that much of this resemblance was wholly spurious. Certain schools . . . prided themselves on an athletic reputation, hence two brothers or two sisters at such schools are usually returned as an athletic pair.'

² See Appendix, p. 130, note on the *Nagada Series*.

Assuming that the Law of Errors is applicable to these series, how should they be interpreted?

At best the mathematical treatment cannot elicit new results, but can only corroborate those obtained by other methods.

The principles which we adopt in treating the Curves of Probability and Frequency.

The principles which we adopt in treating the Curves of Probability and Frequency. Meaning and importance of 'misfit' and 'probable error.'

a closer inspection shows that the great discrepancy between the Frequency and Probability Curves is due in this particular case to an unusual concentration of the specimens in the neighbourhood of the arithmetical mean with a consequent deficiency towards the extremes, so that in spite of the high arithmetical figure obtained for the misfit the cephalic index in the Fourth and Fifth Dynasty males is really much less variable than in some other periods where the misfit of the curves is not so great. This fact is betrayed, apart from ocular observation which would have detected it in any case, by the small arithmetical value of r , the 'probable error.' It is evident, therefore, that to appreciate the meaning of any misfit it is necessary to take into account the *place* in the scale at which it occurs and to check its mere arithmetical figure by a reference to r the 'probable error.'

Next, with regard to the employment of r itself. A comparison of the various series shows that the smallness or greatness of r does not necessarily depend on the size of the series. For instance, in the cephalic index of the first five series of males, for which r has been calculated (Chart I, Fig. 1, series A, B, C, E, F), the following are its values:

In Early Predynastic r is	2.30	with a misfit of 30 per cent. in a series of	53.
In Late Predynastic r is	1.83	" 16 "	125.
In First Dynasty r is	1.92	" 34 "	41.
In Fourth and Fifth Dynasties r is	1.73	" 46 "	54.
In Sixth to Twelfth Dynasties r is	2.03	" 12 "	172.

From which we see that the largest series of all the five has the second highest figure for r , while a series only a third as large has the lowest figure. There is no reason therefore to fear that the value of r is delusive and merely dependent on the number of specimens.

On the other hand, this comparison suggests that the amount of *misfit* is dependent to a considerable degree on the size of the series. Except in the case of the Fourth and Fifth Dynasties, which is somewhat exceptional, there is an evident ratio, the misfit decreasing regularly as the number of specimens increases. But if the other indices, the vertical, upper facial, ortho-prognathism, and nasal (Chart I, Figs. 2, 3, 4, 5), be reviewed it will appear that there is no constant law. While it is true in general that in the smallest series the misfit is much greater than in the large series, yet the contrast is only observable when the series are extremely disproportionate in length. When the number of specimens is at all comparable there is evidence that the misfit is not always dependent on the size of the series. In the vertical index, for instance, it is considerably less for the Late Predynastic series of 105 examples than for the Sixth to Twelfth Dynasties, where there are 171 examples; and again, various series which are of equal length differ greatly in the degree of misfit.

It seems, then, that it would be justifiable to argue about homogeneity and heterogeneity of series from the evidence of the misfit taken in connexion with r , provided only it be remembered that when two series are extremely disproportionate in regard to the number of specimens of which they are composed, the misfit is likely to be much more considerable in the smaller than in the larger series.

An application of such a criterion to the first series of males (Chart I, Fig. 1, series A, B, C, E) shows that there is a far less degree of homogeneity in the Early Predynastic than in any of the three others. The misfit and the values of r are on the whole greater in all the tables, excepting only those of cranial capacity, than they are in any of the other periods, viz. B, C, E. It might be supposed therefore that in the Early Predynastic, if in any period, the irregularity of the curves and the high values of the probable error demonstrated the

presence of more than one component race. Can such an inference be safely drawn? On strict statistical principles, as laid down by the biometricians, an inference of the kind would be illegitimate. The chances against the occurrence in a pure race of such a curve as that displayed by the vertical index of the Early Predynastic males (Chart I A, Fig. 2) have been calculated by the elaborate mathematical method suggested in *Biometrika*, vol. i. pp. 155-63. The result showed that the chance was only the same as the chance against many events which are recognized in daily life as quite probable. That is to say there was, on biometrical principles, no evidence of heterogeneity in the series, but there was equally little evidence of homogeneity. And we need hardly point out that had the form of the question been not 'what are the chances of such a curve occurring in a pure race,' but 'what are the chances of such a curve occurring in a *mixed* race,' the odds against the latter hypothesis would have been infinitesimal.

It may be true that the paucity of examples may be an excuse for the biometrician arriving at no conclusions in this case, but we cannot refrain from pointing out that the material has been sufficient to enable us to definitely recognize the composite nature of the races in this and in other periods represented by the diagrams in Charts I and II of the supplement.

Since, however, other methods of analysis have enabled us to decide the question of heterogeneity already we need not labour the interpretation of the Probability Curves. Accordingly we shall content ourselves with comparing the several periods together in respect merely of their relative characteristics, and shall note subsequently how far these are in harmony with our independent deductions (see pp. 132, 133).

We may leave out of consideration the Fourth and Fifth Dynasty series from Medum and Deshasheh, as they are the only specimens which come from Middle Egypt, that is to say, from a very different locality.

MALES.

Cephalic Index (Chart I, Fig. 1). The least consistent period is evidently the Roman, which has a very large value for r and a great misfit even within these wide limits; and next to this the most inconsistent is the Early Predynastic series. Curiously enough, however, the most consistent series is the Late Predynastic, which is almost matched by the Sixth to Twelfth Dynasties with a slightly larger figure for r , but a less degree of misfit within that larger area. The Eighteenth Dynasty from Abydos shows a high degree of consistency, in marked contrast to the series of the same date from Shekh Ali. The Twelfth to Fifteenth Dynasties from Hou are peculiar in exhibiting a considerable misfit in the neighbourhood of the mean (cf. the high figure of R). Of the others the Ptolemaic and the First Dynasty diagrams give the impression of a comparative consistency which is disturbed by some factors of small importance.

Vertical Index (Chart I, Fig. 2). One series only is strikingly inconsistent, and that is the Early Predynastic with a very high figure for r and a great misfit. It is again the Roman series which stands next to the Early Predynastic in degree of inconsistency, it has the same high value for r , but the misfit is less in amount and occurs in a less significant place. The most consistent periods are the Late Predynastic and the Twelfth to Fifteenth Dynasties from Hou, in both of which the value of r is small and the curve is very symmetrical. The Sixth to Twelfth Dynasties form a very regular curve, which is only remarkable for its great width at the apex. The Eighteenth Dynasty from Shekh Ali and the First Dynasty look like nearly consistent series which have perhaps

The principles which we adopt in treating the Curves of Probability. Meaning and importance of 'misfit' and 'probable error.'

Statement of the limited conclusions which we are willing to draw from the Curves.

Limited
conclusions
drawn from
the Curves.
Males.

suffered some slight disturbance. The Eighteenth Dynasty from Abydos is very regular, but has a rather high value for r . The Ptolemaic curve is fairly consistent, but is askew.

In order to complete the examination of the cranial features before proceeding to the facial, it will be convenient next to consider the *Estimated Cranial Capacity* (Chart I, Fig. 6). It is very difficult to judge of the value of the mathematical properties of the curves of this feature as the range of index-values is so great, and consequently in short series the specimens appear very scattered. When it is farther appreciated that the peculiar variability of the measurement of capacity would tend in any case to impair the uniformity of the series, it can only be considered surprising that the curves of cranial capacity show so much regularity. In the larger series, such as the Late Predynastic and the Sixth to Twelfth Dynasties, the Frequency Curves are remarkably symmetrical, and although there are some places, especially in the Sixth to Twelfth Dynasties, where there is a noticeable misfit, yet on the whole these two periods seem to be quite consistent. It is rather strange therefore that their 'probable error' r should be higher than that of any of the other periods.

The Eighteenth Dynasty from Abydos has very nearly as high a value for r , but it has a very much greater misfit than the two series just mentioned; and the Eighteenth Dynasty from Shekh Ali with a much lower value for r shows a misfit of very significant character. Both these series then we should judge to be 'inconsistent.' In view of its small 'probable error' and inconsiderable misfit it is hardly possible to call the Ptolemaic curve inconsistent, but the accumulation of specimens at the higher capacities and deficiency at the lower indices is suspicious, and the Frequency Curve, even with the irregularities smoothed out, would be distinctly askew. The Early Predynastic and the Roman are nearly consistent, the latter less so than the former.

The First Dynasty and the Twelfth to Fifteenth series resemble one another in showing an unusual concentration at the mean, of which at present we can offer no interpretation. To pass on to the facial features.

Facial Index. The large Sixth to Twelfth Dynasty series, which stands midway in chronological order, may serve as a basis of comparison. First then it is to be remarked that the diagram of the facial index for the Sixth to Twelfth Dynasties is by no means consistent. Its 'probable error' is very large, and the accumulation of examples near the mean, the deficiencies between indices 48 and 50, and the excess of examples on index 46 render the series far from uniform.

Of the periods preceding this the Early Predynastic has a large 'probable error,' a very flattened apex and misfits at very significant points, so that it may be regarded as 'inconsistent.' The Late Predynastic, however, is a very constant curve except for the excess of examples on index 50, of which the significance is discounted by the deficiencies at 49 and 51; the probable error is smaller, and the series may be regarded as consistent.

In the periods subsequent to the Sixth to Twelfth Dynasties it is very noticeable that there is a decrease in the 'probable error' for all the series until the Roman. The Eighteenth Dynasty from Abydos shows a virtually perfect curve with a very small probable error, and the consistency of the Eighteenth Dynasty from Shekh Ali is only disturbed to a slight degree. The Ptolemaic and perhaps also the Twelfth to Fifteenth Dynasties from Hou resemble the Shekh Ali Eighteenth in showing consistent curves with some disturbances of little real importance. But the Roman series has such a large

probable error that though the curve is comparatively symmetrical it cannot be regarded as representing a closely uniform type.

Limited
Conclusions
drawn from
the Curves.
Males.

Orthognathism and Prognathism. This is a feature which seems to adapt itself less than others to the treatment of the Binomial Curve. Thus while some specimens may be 'hyperorthognathic' few are likely to be many degrees behind the vertical in respect of facial projection. Indeed there seemed to be a certain amount of absurdity in classifying hyperorthognathism stage by stage, and when it occurred in the working out of the various grades of facial projection it was considered sufficient to record a single degree of it and to register under the one heading of $-A$ all hyperorthognathic specimens. It must be admitted, however, that some did occur more than one place to the left of A , and this has induced us to calculate the 'misfit' in the tables of orthognathism-prognathism in a different way from the others. It has been calculated on the hypothesis that the specimens registered simply as $-A$ would have been distributed regularly in accordance with the Law of Errors over the requisite number of places to the left of A . This is a distinct concession which has been made in order that we might not seem to be unfairly emphasizing the largeness of misfit. The quoted values of the misfit throughout are therefore no doubt less than they would have been without this amount of 'smoothing' of the curve. The several periods are of course strictly comparable with one another, the same procedure having been adopted in all.

By far the most inconsistent series is the Early Predynastic, with a probable error of 2.46 and a very large misfit. Next to this comes the Twelfth to Fifteenth from Hou, with a probable error of the same amount but a less misfit. The difference in the character of the misfit in these two cases is significant, as in the Early Predynastic there are two equal maxima of frequency a long distance apart, viz. one in orthognathism and the other in mesognathism, whereas in the Twelfth to Fifteenth from Hou the maximum is confined to the orthognathic part of the scale. Several series show a very small probable error and an amount of misfit which for a feature of this kind must be reckoned inconsiderable. Thus the Eighteenth Dynasty from Abydos must be considered a consistent series, and so also must the Roman. The Late Predynastic and the Sixth to Twelfth Dynasties are consistent, with only some slight disturbances. Rather less consistent than these is the Eighteenth Dynasty from Shekh Ali, which is decidedly less uniform than the series of the same date from Abydos. The great misfit of the Ptolemaic series is mainly due to the piling up of specimens about the mean, but the occurrence of several very prognathic examples prevents it from being a consistent series.

Nasal Index. The least consistent series of all is that from Hou, with a very large probable error, a great misfit, and several distinct maxima of frequency. In the Early Predynastic, though too much stress must not be laid on the occurrence of 'modes' in so small a series, yet the value of r is very high and the misfit is very significant in character as well as in amount. The least inconsistent series are the Sixth to Twelfth Dynasties, where the curve is pretty regular but the range of variation is large, and the Late Predynastic, with a very similar value for r but a greater amount of misfit. The two Eighteenth Dynasty series have an identical value for the probable error and that not very different from the Sixth to Twelfth series, but both exhibit a very large and significant misfit. The Roman series is distinctly inconsistent, with a wide variation and considerable misfit.

The examination of the Probability Curves of the six features suggests, therefore, considerable differences in the composition of the series representing the several periods.

Limited
Conclusions
drawn from
the Curves.
Males.

Certain series show marked irregularities in the curve and a high figure for the probable error in most or in all of the six features, whereas others give comparatively symmetrical curves and have consistently slight probable errors. Thus the Early Predynastic specimens are very variable in every single feature except the cranial capacity, whereas the Late Predynastic and the Eighteenth Dynasty from Abydos are remarkably consistent and homogeneous-looking in almost all their features. Some periods might seem to be heterogeneous in regard to some characters, but not in regard to others. Thus the Roman specimens look very suspicious in the cephalic, vertical, and nasal indices, but less so in their other features. Similarly the Twelfth to Fifteenth Dynasties from Hou look heterogeneous in respect of facial projection and nasal index, but not in the cranial as distinguished from the facial characters. Conversely the series of the Eighteenth Dynasty from Shekh Ali looks heterogeneous in the cranial characters of cephalic index and capacity, but otherwise only in the nasal index. On the other periods for which the calculations have been made, while no safe verdict perhaps can be passed from the mere inspection of their curves, it may be found that the peculiarities of these curves are explicable by the conclusions which have been obtained by other methods.

FEMALES.

Females.

Cephalic Index. The greatest variability combined with misfit is seen in the Early Predynastic and in the Eighteenth Dynasty from Shekh Ali, which in this respect closely resemble the male series of the same periods. The probable error of the Ptolemaic series is nearly as great, and the misfit is actually the same as in the Early Predynastic; so that the Ptolemaic females are rather more variable in respect of this index than the males. But the immediately subsequent Roman period exhibits as little variability as any, thus contrasting remarkably with the contemporary males. The Eighteenth Dynasty from Abydos are like the males, in showing less variability than the series of the same date from the site of Shekh Ali.

The least variable series next to the Roman is that of the Eighteenth Dynasty from Abydos; next to which may be placed the Late Predynastic, the Twelfth to Fifteenth Dynasties from Hou, and the Sixth to Twelfth Dynasties. Of these the Twelfth to Fifteenth Dynasties are rather more consistent, and the Sixth to Twelfth Dynasties rather less consistent than the corresponding series of males. The First Dynasty females closely resemble the First Dynasty males and can hardly be judged to form a consistent series.

Vertical Index. The most variable period is the Roman, which has a larger probable error than occurs in the vertical index of the males of any period, as well as a great misfit. Almost as variable and even more irregular in its curve is the Eighteenth Dynasty series from Shekh Ali. The nearest to these in date contrast strongly with them in character; thus the Eighteenth Dynasty from Abydos has a small amount of probable error (though there is a curious mode at 74), and the Ptolemaic is one of the least variable series.

The least variability of all is seen in the Late Predynastic, since though the probable error is less in the Twelfth to Fifteenth Dynasties from Hou the misfit is considerable. The Twelfth to Fifteenth Dynasties from Abydos are more variable than those from Hou. The First Dynasty shows a small probable error and a nearly regular curve, in which respects the females of this period are slightly superior to the males. In the large Sixth to Twelfth Dynasty series the curve is fairly regular, but the probable error is appreciably greater than in some other periods which contain far fewer examples; it is greater also than

in the corresponding series of males. The Early Predynastic series shows misfit of a distinctly definite character.

Cranial Capacity. In the first place it must be observed that the variation of capacity in the females as estimated by the probable error is throughout much less than in the males.

Limited
Conclusions
drawn from
the Curves.
Females.

The smallest probable error is in the Twelfth to Fifteenth Dynasties from Hou; next to this come the Romans with $r = 56.2$, which like the last is a smaller value than occurs anywhere in the capacity of the males. The Twelfth to Fifteenth Dynasties from Abydos have a slightly greater probable error than those from Hou, but exhibit a very symmetrical curve. The Eighteenth Dynasty series from Abydos closely resembles those of the Twelfth to Fifteenth Dynasties from the same site, the females again being much more consistent than the males of the same time. The probable error of the Eighteenth Dynasty from Shekh Ali is greater than that of the contemporary series from Abydos; but the curve is regular, in marked contrast to that of the males. In the Ptolemaic series there is the same probable error as in the Eighteenth Dynasty from Shekh Ali, but the misfit is considerable and important; the character of the series resembles that of the Roman males rather than of the Ptolemaic males or of the Roman females.

The most inconsistent series of all is the First Dynasty, with the largest probable error and a striking misfit. A nearly identical amount of probable error but a less important misfit occurs in the Sixth to Twelfth Dynasties. Having regard to the nature of the measurement we cannot judge the Late Predynastic females to be other than homogeneous in respect of cranial capacity; while in the Early Predynastic the curve is no doubt consonant with the requirements of the theory of probability, though it is to be remarked that the degree of variation is greater than in some periods.

Facial Index. The more inconsistent series are the Early Predynastic and the Roman. Of these the Early Predynastic show much the same variability as the contemporary males; but the Roman females are less variable than the males; their curve, in fact, would be nearly symmetrical but for the occurrence of a few specimens with very low indices. The Ptolemaic females, which stand next in degree of variability, can hardly be called inconsistent and are very similar to the males of the same date.

The remaining series are remarkable for the small amount of variability which they exhibit in comparison with the males. The most homogeneous of all are those from the two Eighteenth Dynasty sites, in which the females closely resemble one another, though the females from Shekh Ali have a much smaller probable error than the males.

The two series of the Twelfth to Fifteenth Dynasty females are very similar to each other and to the Eighteenth Dynasty series; those from Abydos are slightly the more uniform, but in both sites there is a considerable contrast with the males. The Late Predynastic and the Sixth to Twelfth Dynasties show a slightly larger probable error than those hitherto noticed, but are more homogeneous than the contemporary males. The curve presented by the First Dynasty females is hardly to be estimated as pure.

Orthognathism and Prognathism. The most inconsistent series is that of the Eighteenth Dynasty from Shekh Ali; its variability is indeed much less than that of several series in the males, but it is greater than that of the males of the same site and date. In the Eighteenth Dynasty from Abydos the variability and misfit are less than in the three specimens, but there is nothing like the homogeneity which is apparent in the males from Abydos. The series of the Twelfth to Fifteenth Dynasties from Abydos

Limited
Conclusions
drawn from
the Curves.
Females.

closely resembles that of the Eighteenth Dynasty from Shekh Ali; but those from Hou are more homogeneous, in strong contrast to the corresponding series of males.

The most consistent series are those of the Sixth to Twelfth Dynasties and of the Early Predynastic period (the difference in the mean at those two dates, however, should be remarked). The Late Predynastic is very little less consistent than these. It is to be noted that in the Sixth to Twelfth Dynasties and in the Late Predynastic the females closely resemble the males, but the Early Predynastic females are very different from the males.

The First Dynasty, while it has the least probable error of any of the female series, shows a large misfit; moreover, though its figure is low the probable error exceeds that recorded for so consistent a series as the Eighteenth Dynasty male from Abydos. The Ptolemaic and the Roman, which resemble one another in general character, are hardly to be regarded as consistent, and the Roman females vary much more than the males.

Nasal Index. In the first place it should be noticed that with regard to this feature the female series exhibit in general more variability than the males. The most inconsistent series of all is the Roman, almost matched, however, by the Ptolemaic, which contrasts strikingly with that of the Ptolemaic males. Of the two Eighteenth Dynasty series that from Shekh Ali, though it has a rather smaller probable error, is otherwise less consistent than that from Abydos. Both are more variable than the contemporary males.

The most consistent series is the Early Predynastic, which by way of exception shows less variability than the corresponding table of males. Next to it may be placed the Late Predynastic and the First Dynasty. Fourth in order of consistency would come the series of the Sixth to Twelfth Dynasties with a curve which is not unsymmetrical but is disturbed in some places, and with a probable error which would be somewhat high for a pure series. Almost the same amount of probable error appears in the two Twelfth to Fifteenth Dynasty sites, the Hou specimens exhibiting a very great misfit, though they are more consistent than the males of the same date.

Some interesting points are brought out by this examination of the Probability Curves of the females. Thus in the first place it is to be noted that they do not merely repeat the conditions which obtained in the males. On the contrary, some periods which were very inconsistent in the males are quite consistent in the females and vice versa, while sometimes again the males and females of a given date exhibit a perfect analogy to one another. With regard to the several features considered by themselves, in cranial capacity the females are in general less variable than the males, but in the nasal index the females are much the more variable. In respect of facial projection, on the other hand, while the females do not show so great a tendency to wide variation, they do not give evidence of the high degree of consistency which is occasionally found in the males.

The most inconsistent of all the female series are the Roman, with a great variability and irregularity of distribution in three features (viz. vertical, facial, and nasal indices), and the Eighteenth Dynasty from Shekh Ali, which is also very variable in three features (viz. cephalic and vertical indices and ortho-prognathism). It is curious, however, that each of these shows a high degree of consistency in other features. The Early Predynastic females exhibit great irregularity and variability in two important features (viz. the cephalic and facial indices), but not in the rest. Among the least variable series throughout are the two which were so consistent in the males, viz. the Eighteenth Dynasty from Abydos and the Late Predynastic.

So far we have confined our attention to such properties of the curves as the misfit and the probable error; but it must not be forgotten that M , the arithmetical mean, is

also of great importance. It is this which shows the prevalent type, and the variations of M in the different periods furnish evidence of the modifications and changes of the type. These, however, are most profitably studied in another connexion, for the variations of the median in the different periods are recorded in the diagrams of Plates x-xv (cf. pp. 55, 56), and the median of a series (i.e. that grade of index above and below which there are an equal number of specimens) always corresponds closely to the arithmetical mean. It will be sufficient in this place to call attention to the fact that the arithmetical mean exhibits very considerable differences in the types of the several periods, and that sometimes, though by no means always, these differences follow a regular chronological progress.

Limited
Conclusions
drawn from
the Curves.
Females.

In the Appendix (pp. 132, 133) is given a table in which these results obtained from the Curves of Probability are shown by the side of those obtained by our independent analysis of the component groups.

CHAPTER IX

DETAILED EXAMINATION OF THE PERIODS FROM THE EARLY PRÉDYNASTIC TO THE FIFTH DYNASTY

Group I is
negroid.
Group II
is non-
negroid.

UP to the present we have been occupied in describing the details of the various methods employed in the present work.

It now remains for us to subject the several periods to an analysis based upon such of these methods as seem to us to yield the most definite results. We shall be unable to make any extensive use of Professor Sergi's system, which, owing to the circumstances, it was impossible to apply to the entire collection, though we must remind the reader that where we had the opportunity of testing the system it appeared to us to lead to no fruitful conclusions. The same may be said, with certain limitations, of the 'biometrical' method for the reasons given in Chapter VIII. Accordingly we are left with the data furnished by the employment of Frequency Curves and percentages, by the graphic analysis of the distribution of correlations and the graphic analysis of types.

In Chapter IV we explained the method whereby we were able to determine the existence of two groups amidst the population with which we are dealing. In the three periods now under examination we have ample evidence of the occurrence of such groups, and it may not be amiss to state here what interpretation we place upon this circumstance. There seems little reason to doubt that the features of Group I betray a negroid influence. In every character of which we have a measure they conform accurately to the negro type; and in many respects, as may be seen from the photographs, they exhibit appearances which, judged by the eye, certainly lend very strong additional support to this view. Amongst such we may note, in the specimens which we have at our disposal, the modelling of the forehead, the interocular width, and that peculiar form of nasal aperture described by the French as *gouttière simienne*. The excavators at El Amrah noted on several occasions that the hair which adhered to the scalp was curly, as distinguished from other hair of a straight or wavy kind, which also occurred in the graves¹.

On the other hand, the characteristics of Group II are decidedly those of a non-negroid stock.

In addition to the two main components there are a certain number of specimens which cannot be assigned to either group. These are sometimes contradictory forms resulting no doubt from crossing, and at other times intermediates, which may be either half-breeds of more stable strain or intruders of alien origin. These opposed groups apparently lived together on terms of equality and friendship at the earliest period of

¹ It might be remarked also that some dolls found in the graves were represented with curly black hair. In general, however, we do not concern ourselves with such evidence. The rudely-carved faces in ivory and slate, the steatopygous figures of women, &c. &c., have furnished material on which various authors have already exercised their ingenuity. We are on much safer ground in dealing with the skulls, as to which we know two facts that can never unhesitatingly be asserted of figures or drawings, viz.:—

(1) That they represent real and not imaginary types.

(2) That they represent individuals who lived in Egypt and not in some other country.

which we have any knowledge. An examination of the tomb equipment has shown that neither can be considered as superior to the other in wealth or position at this time, whatever may prove to be the case in later ages. (Cf. Appendix, pp. 115-117.)

Group I is
negroid.
Group II
is non-
negroid.

The non-negroid stock is throughout numerically stronger than the other, the relative proportion varying from time to time and from place to place. Thus in the Early Predynastic period the negroid stock is represented by 24 per cent. in the males and $19\frac{1}{2}$ per cent. in the females¹, the non-negroid by $48\frac{1}{2}$ per cent. in the males and 44 per cent. in the females. In the Late Predynastic the negroid males are $24\frac{1}{2}$ per cent. and the negroid females 28 per cent. as against $44\frac{1}{2}$ per cent. males and $38\frac{1}{2}$ per cent. females of the non-negroid stock. In the First Dynasty the females are equally divided between both stocks (29 per cent.), while in the males the non-negroid has still the preponderance. The divergencies between localities should not be overlooked; there are just twice as many females of the negroid stock at Hou in the first three periods as there are on the neighbouring sites of El Amrah and Abydos².

Acting on the suggestions of Sergi, Kollmann, and Meyer, we were naturally desirous of ascertaining whether or no there was evidence of a pygmy stock in either or all of the first three periods. Professor Kollman's conclusion³ that there was a pygmy element amounting to something like 20 per cent. of the entire population of Abydos in this archaic time, appears to us to be based upon insufficient evidence, resting as it does entirely upon the occurrence of small skulls with low capacity. Instances of this kind have frequently occurred during our investigations, and we have subjected all the examples to a rigorous examination. Fortunately for us we possess in some cases the long bones belonging to the skeleton of which the skull is a part, and in many other cases we have the measurements of the limbs though not the actual bones themselves. On investigation of these it soon appeared that the skulls which we had assumed to be typical pygmy crania were in reality often associated with bodily proportions well up to the average standard of the people. Reversing the process and taking into consideration only the femora of short length, or in other words the smaller individuals, we found that such individuals exhibited all varieties of head-size and capacity. In the cases where there was a correspondence between the size of the head and the smallness of the stature we further analysed the specimens to ascertain whether or no they displayed any uniformity of type. The numbers were not large and therefore perhaps our inferences are not conclusive, but it was noted that the specimens ranged through all the scale of the facial and nasal indices and did not display any common characteristics.

Prof. Koll-
man's theory
of the
existence of
a pygmy
element
examined.

It seems to us, therefore, that at present we have no such evidence as would justify us in assuming the existence of a pygmy stock, for the number of small individuals is only such as might be expected to occur in the seriation of a considerable population according to height.

As to what the general stature of the living population may have been we decline to commit ourselves, at any rate for the present, to any standards based on theoretical reconstructions. It may be useful, however, to tabulate the femoral lengths (maximum length) of the various series for which we possess the data, in order to determine whether the stature, whatever its absolute measurement maybe, varies from period to period.

¹ Vide Tables II and III, p. 53.

² The Hou specimens can readily be picked out in the tables of the supplement (Charts I and II, A, B, C) as their catalogue-numbers are all over 1,000.

³ *Correspondenz-Blatt der Deutschen anthropologischen Gesellschaft*, nos. 11 and 12, 1902.

Femoral length as evidence of stature in the several periods.

The average (median) femoral lengths in millimetres in the various series are as follows :—

	MALES.		FEMALES.	
	<i>Femoral length.</i>	<i>Number of Examples.</i>	<i>Femoral length.</i>	<i>Number of Examples.</i>
Early Predynastic	450 mm.	28	435 mm.	27
Late Predynastic	450 „	59	425 „	60
First Dynasty	460 to 470 „	10	422 „	15
Sixth to Twelfth Dynasties . . .	454 „	128	414 „	89
Twelfth to Fifteenth Dynasties, Hou (excluding 'Pan-tombs') . . .	450 „	47	419 „	49
'Pan-tombs' of Twelfth to Fifteenth Dynasties	466 to 480 „	8	430 „	10
Ptolemaic period	450 „	28	416 „	15
Roman period	447 „	6	400 to 411 „	10

It does not appear that there is any appreciable difference between the females of the two opposite race-stocks in respect of femoral length. The males of the non-negroid stock, however, average about one centimetre more than those of the negroid stock in the length of the femur. Thus in the Early Predynastic, Late Predynastic, First Dynasty, Sixth to Twelfth Dynasties, and the Twelfth to Fifteenth Dynasties from Hou, the femoral length of the non-negroid males averages regularly 458 mm., whereas that of the negroids is 444–447 mm. (excluding the 'Pan-tombs' of Hou).

The chief points of the evidence obtained by the system of percentage classification (Table 1) and by the schematic diagrams of Plates x–xv may now be formulated for the first three periods. We will proceed by quoting first the points for the undivided series, and then for each of the two main groups into which it has been shown that the population may be divided.

UNDIVIDED SERIES. MALES.

Formulation of all the evidence bearing on the Early Predynastic, Late Predynastic, and First Dynasty periods.

(a) *Cephalic Index.* The average (or more precisely the *median*¹) cephalic index is lower in the Early Predynastic than in any subsequent period. In passing to the First Dynasty it is to be seen that though the alteration in the average (median) index is very slight, yet there is a decrease in the percentage of dolichocephals.

(b) *Capacity.* Here the most striking feature is a general rise in the average capacity of the males, viz. from a median of 1,370 cc. in the Early Predynastic to 1,390 cc. in the Late Predynastic and 1,440 cc. in the First Dynasty.

Though the difference between the medians for Early Predynastic and First Dynasty only amounts to 70 cc. it may be pointed out that the percentage of microcephalic males in the First Dynasty (20 per cent.) is only half what it was in the Early Predynastic (40 per cent.). The First Dynasty again shows a corresponding increase in the percentage of specimens assigned to the mesocephalic and megacephalic classes, the mesocephalic being almost the most numerous of any period in the history. That is to say that in general the male population of the First Dynasty is larger-headed than it was before, while the Late Predynastic occupies a transitional place between the Early Predynastic and the First Dynasty. This rise in the cranial capacity (70 cc.) is associated with a slight rise in the median of the cephalic index, viz. from 71.5 to 72.5, and the reduction in the percentage of microcephalic specimens in the First Dynasty is also associated with a very slight reduction in the percentage of dolichocephalic specimens.

¹ The median has been chosen rather than the arithmetical mean for the purpose of these schematic diagrams for reasons given on p. 55. In the case of the capacity this median is taken from the curves published in Charts I and II where the unit of differentiation is 20 cc. The arithmetical mean for the undivided series is always to be found, if needed, among the calculations at the foot of each curve in Charts I and II, and the precise values of the capacity are entered in the list of measurements of each specimen in the Appendix.

(c) *Vertical Index.* The percentage of males in the Early Predynastic period with high vaults to the head is large (20 per cent.). This is a characteristic which practically disappears in the Late Predynastic, where there are only 2 per cent. But it reappears in the First Dynasty (11 per cent.).

(d) *Facial Index.* In the First Dynasty there is a shortening of the face in comparison with the Early and the Late Predynastic periods, as is shown by the decrease in the median. In the First Dynasty the median falls within the mesoprosopic division, whereas in the two preceding periods it was in the leptoprosopic.

(e) *Nasal Index.* The Early and the Late Predynastic periods are virtually identical both in respect of the median of the nasal index and also in the percentage of platyrrhine specimens. The median remains almost unaltered in the First Dynasty, but the percentage of platyrrhine males falls from 36.5 to 24. The medians are in the mesorrhine class in all three periods.

(f) *Orthognathism and Prognathism.* In the Early Predynastic 7 are prognathic out of a total of 35 males (it is preferable to quote the actual numbers when the series is so small). In the Late Predynastic the proportion of prognathic specimens has decreased to half what it was in the preceding period (9 out of a total of 96). In the First Dynasty this decrease is continued, only 2 out of a total of 26 being prognathic.

Formulation of all the evidence bearing on the Early Predynastic, Late Predynastic, and First Dynasty periods.

UNDIVIDED SERIES. FEMALES.

(a) *Cephalic Index.* The median of the cephalic index is lower in the Early Predynastic than in any subsequent period.

Between the Early Predynastic period and the First Dynasty there is a slight diminution in the percentage of dolichocephalic females (Early Predynastic, 67 per cent.; Late Predynastic, 60 per cent.; First Dynasty, 59 per cent.). This is associated with a rise in the median cephalic index, viz. from 72.5 in the first two periods to 73.5 in the First Dynasty.

N.B. The males, whether judged by the median or by their percentage classification, are more dolichocephalic than the females throughout the whole history from first to last. Similarly in the mesocephalic division the females always outnumber the males.

(b) *Capacity.* The median index of the females remains practically unchanged through the first three periods. This is in spite of a slight rise in the cephalic index; an apparent contradiction which is perhaps accounted for by the circumstance that there has been a simultaneous fall in the average vertical index (see the arithmetical means as given in Chart II).

As in the males so also in the females the First Dynasty witnesses an increase in the percentage of mesocephalic and megacephalic individuals. The difference in this respect between the early and the Late Predynastic females is slight, and is somewhat obscured by the total absence in the Early Predynastic period of any megacephalic females.

It is noteworthy that in the First Dynasty the difference in cranial capacity between the men and women (190 cc.) is much greater than in the two preceding periods (120-130 cc.). This suggests the unequal influence of culture on the two sexes.

(c) *Vertical Index.* The percentage of high-vaulted heads is fairly constant in the females throughout the first three periods, tending, however, slightly towards a decrease (8, 7, and 3½ per cent.). In the males, as has been remarked above, there is a striking preponderance of high-vaulted heads in the Early Predynastic time.

If the two sexes are compared in these periods it will be seen that in the Early Predynastic the percentage of low-vaults is practically the same for males and females. In the Late Predynastic they are 12 per cent. more numerous in the males, whilst in the First Dynasty they are 13 per cent. more numerous in the females.

(d) *Facial Index.* In the females the medians for this index fall within the leptoprosopic group for all three periods. The face shortens, as judged by the median, which decreases by 1½ units in the Late Predynastic and remains at that level in the First Dynasty.

The distribution of the classes according to percentage is much the same in the Late Predynastic and First Dynasty, which alike show about 10 per cent. fewer examples of leptoprosopy than the Early Predynastic. It should be noticed that this diminution in the percentage of leptoprosopic women is accompanied by an increase in the percentage of broad noses (see *infra*, p. 90); and further that it is associated with the proportionate increase in the representation of the negroid group and decrease in the representation of the non-negroid.

(e) *Nasal Index.* In the females as in the males the median of the nasal index remains unchanged between the Early and the Late Predynastic. In the First Dynasty, however, the nose of the women is 1½ units wider than it was before.

In the Early Predynastic period the percentage of platyrrhine males is higher than that of platyrrhine females; but in the following periods the case is reversed, in the First Dynasty, indeed, the females are 18 per cent. more platyrrhine than the males. In contrast to the males, in whom there

Formulation of all the evidence bearing on the Early Predynastic, Late Predynastic, and First Dynasty periods.

was a progressive decrease in the percentage of broad noses, the females show a steady rise in the proportion of platyrrhine examples, viz. from 28 per cent. in Early Predynastic to 39 in Late Predynastic and to 42 in First Dynasty.

(f) *Orthognathism and Prognathism.* In the Early Predynastic period 15 per cent. of the women (i.e. 6 out of a total of 40) are prognathic. In the Late Predynastic 19 per cent. and in the First Dynasty 8 per cent. are prognathic. That is to say that though there is not a diminution in the number of prognathic women, as there was of prognathic men between the Early and the Late Predynastic, yet there is a distinct decrease in their number at the time of the First Dynasty, just as was seen to be the case with the men.

DIVIDED SERIES. THE SEPARATE RACE-STOCKS.

The proportionate representation of the two separate race-stocks in the three earliest periods has been stated above. The variations which they each undergo may now be considered. The numbers being too few to admit of percentaging only the average (median) indices are considered.

GROUP I (Negroid). *Males.* As regards the upper facial index the median remains unaltered between the Early and Late Predynastic periods, viz. at the figure of 52.5. In the First Dynasty the face shortens to 51.5. In the nasal index there is little variation in the three periods. In the Late Predynastic and the First Dynasty the cranial capacity rises 50 to 70 cc., a change which is associated with a rise in the cephalic index from 71 in the Early Predynastic to 71½ in the Late Predynastic and 74½ in the First Dynasty. The smallness of the number of specimens, however, belonging to this group in the Early Predynastic and First Dynasty prevents us from attaching great importance to this point.

Females. The median of cranial capacity rises from 1,190 cc. in the Early Predynastic to 1,280 cc. in the Late Predynastic and 1,270 cc. in the First Dynasty. Curiously enough this rise is accompanied by a simultaneous fall in the cephalic index, in regard to which, however, it is to be noted that there is also a fall in the vertical index (see *infra*). But though this result appears in the medians it must be received with caution as the number of examples of the group in the Early Predynastic is very small.

In facial features the only point to be noticed is a slight lengthening of the face.

GROUP II (Non-negroid). *Males.* The median of the upper facial index remains virtually unaltered between the Early and Late Predynastic periods; but in the First Dynasty there is a shortening of the face accompanied by a slight widening of the nose.

The cranial capacity remains virtually the same throughout, while the cephalic index oscillates between 71.5 in the Late Predynastic and 73.5 in both the Early Predynastic and the First Dynasty.

Females. There is a more marked change between the Late and Early Predynastic than between the Late Predynastic and First Dynasty in regard to facial, nasal, and cephalic index.

Thus in the Late Predynastic the median of the facial index falls three units while that of the cephalic index rises three units and that of the nasal rises one. Whereas in the First Dynasty the nasal index and the cephalic index remain at virtually the same value as they were in the Late Predynastic, and only the facial index shows a variation (viz. 2 units).

But in the First Dynasty there is a much more noticeable rise in the cranial capacity, which goes up to 1,360 cc. as contrasted with the 1,210 cc. of the Early Predynastic and the 1,260 cc. of the Late Predynastic.

A general review of the three periods shows that the two race-stocks are most widely contrasted in the Early Predynastic, and approximate more closely in their characteristics in the Late Predynastic time, while the First Dynasty occupies an intermediate position.

The medians of the vertical index and of Ortho-Prognathism, which have not yet been quoted as they were not employed in the schematic diagrams, may be given here. They are as follows:—

	Males of Group I. (Negroid.)	Males of Group II. (Non-negroid.)	Females of Group I. (Negroid.)	Females of Group II. (Non-negroid.)
VERTICAL INDEX:				
Early Predynastic . .	72½	73½	75	73½
Late Predynastic . .	71	72	73	73
First Dynasty . . .	73½	75	72	73½
ORTHO-PROGNATHISM:				
Early Predynastic . .	CD to D	A	D	AB to B
Late Predynastic . .	CD	AB to B	CD to D	B to BC
First Dynasty . . .	BC to C	B	CD	AB to B

The most significant points in the evidence formulated above seem to be the following :—

The most significant points in the evidence formulated above.

IN THE MALES.

Cephalic Index and Capacity. In the seriation of the entire population the median of the cephalic index rises slightly throughout the three periods, while there is a reduction in the percentage of dolichocephalic specimens at the time of the First Dynasty.

A very similar phenomenon is to be observed in the development of the cranial capacity; there is not any pronounced increase in the size of the brain, but there is a distinct rise in the proportion of individuals with fair-sized brains.

If the two race-stocks are examined individually in regard to these points it will appear that the changes are more definite in the negroid than in the non-negroid element. The latter is apparently the more stable factor in the population, whereas the negroid part of the population is displaying such changes as we may be justified in ascribing to the educational influence of a rising civilization (cf. Chap. I, pp. 11, 12, 13).

IN THE FEMALES.

Cephalic Index and Capacity. In the seriation of the entire population the median of the cephalic index rises slightly through these three periods.

The median capacity, on the other hand, remains unchanged. This apparently contradictory result is probably due to a decrease in basi-bregmatic height in the skulls in question (see ante, pp. 89, 90).

With regard to the two different race-stocks it is to be remarked that the rise in capacity is not, as in the case of the males, confined to the negroid element in the population. That this rise in the medians of capacity is accompanied by a reduction instead of by a rise in the medians of the cephalic and vertical index of the negroid females may be explained by the peculiar character of the females of the negroid group in the Early Predynastic period. These, which with a single exception all came from Hou, form a small but compact knot of individuals with a cephalic and a vertical index a little higher than is usual in the negroid group. In fact, though undoubtedly negroids these women probably originated from some different tribe to those of which Group 1 was generally composed. (See Appendix, p. 120, for the catalogue-numbers of the specimens, and Chart II A for their respective indices.)

From the private tombs of the First Dynasty we pass to the small series obtained from the burials around the great Royal Tombs of the First and Second Dynasties at Abydos. Here the first point of importance is to observe that out of the 15 male specimens for which nasal and facial indices could be calculated no less than 11 belong to the non-negroid and only 1 to the negroid element. Of 10 female specimens 5 belong to the non-negroid and 2 to the negroid.

The Royal Tombs of the First and Second Dynasties.

Consequently only one group is represented in the schematic diagrams. The number of examples was too small to allow of the profitable employment of the method of percentages so it can be stated only in absolute numbers that as regards the several indices—

In the Cephalic Index. Of 26 males, 15 are dolichocephalic, 10 are mesaticephalic, and 1 brachycephalic.

Of 15 females, 8 are dolichocephalic, 4 mesaticephalic, and 3 are brachycephalic.

The Royal
Tombs of
the First and
Second
Dynasties.

In the Nasal Index. Of 20 males, 10 are leptorhine, 8 mesorhine, and 2 platyrhine.

Of 14 females, 5 are leptorhine, 7 mesorhine, and 2 platyrhine.

In the Vertical Index. Of 23 males, 9 are tapeinocephalic, 13 metriocephalic, and 1 acrocephalic.

Of 12 females, 5 are tapeinocephalic, 5 metriocephalic, and 2 acrocephalic.

In the Facial Index. Of 15 males, none are chamaeprosopic, 9 mesoprosopic, and 6 leptoprosopic.

Of 10 females, 2 are chamaeprosopic, 3 mesoprosopic, and 5 leptoprosopic.

In Capacity. Of 22 males, 5 are microcephalic, 7 mesocephalic, and 10 mega-cephalic.

Of 11 females, 7 are microcephalic, and 4 mesocephalic.

Orthognathism and Prognathism. Of 18 males, 1 is hyperorthognathic, 15 orthognathic and mesognathic, and 2 prognathic.

Of 10 females, 2 are hyperorthognathic, and 8 orthognathic or mesognathic.

The males of this series are in general similar to the First Dynasty in cranial capacity (1,430), but have a cephalic index of 74 as contrasted with the $72\frac{1}{2}$ of the First Dynasty. The nose is narrower ($48\frac{1}{2}$) than in any of the preceding periods.

In the females the capacity has risen to 1,300 and there is a rise of one unit in the cephalic index ($74\frac{1}{2}$), the nose is narrower than in the two immediately preceding periods, and a trifle narrower than in the Early Predynastic.

Here then in the attendants or courtiers who were buried with the kings of the First and Second Dynasties it is the non-negroid element which is markedly in preponderance. This may have some significance in view of the probability that the individuals in question were of superior social standing, but the reader must be reminded that in the previous periods an examination of the tomb equipment afforded no reason to suppose that there was any difference of social standing between the two racial elements.

The non-negroid stock in these graves preserves all its characteristics, and the narrowing of the nose in the males suggests a refinement of the type.

The Third,
Fourth, and
Fifth Dynas-
ties.

As representatives of the next chronological period, viz. Third and Fourth Dynasties, we possess only 11 males and 5 females from the site of Regagnah in Upper Egypt (see Appendix, p. 119). We have, however, a considerable series of measurements of crania of the Fourth and Fifth Dynasties, which were obtained from sites far distant from the Theban province with which we have hitherto been concerned. They belong to the sites of Deshasheh and Medum in Middle Egypt and were measured respectively by Professor William Flinders Petrie and Dr. Garson, to whose courtesy we are indebted for the use of this material. They have up to the present point been excluded from any of the analytical statements in order to avoid disturbing the continuous history of a population resident in a closely circumscribed geographical area.

But at this stage they may be taken into passing consideration as they afford corroboration of an opinion to which we have been led by an examination of the specimens from Regagnah.

In the 11 Regagnah males there is nothing special to remark in regard to the facial index (57) or the nasal index (50). The average cephalic index is 74, which is identical with that of the males of the Royal Tombs and higher than that of the other preceding series. But the remarkable characteristic of these men from Regagnah is their great

skull-capacity. The average of the series is 1,508 cc., which is 78 cc. higher than that of the males of the Royal Tombs, and no less than 8 out of the 11 are megacephalic.

The Third,
Fourth, and
Fifth Dynas-
ties.

Now it is precisely their remarkably high skull-capacity which distinguishes the males of Medum and Deshasheh from any of the other Upper Egyptian series. The average figure for the two sites combined is 1,496, or if they are considered separately the average for Medum is 1,456 and for Deshasheh 1,528. The two sites of Middle Egypt, therefore, while they differ from one another in the degree of their megacephaly, are yet alike in exhibiting a skull-capacity much higher than that which obtained in Upper Egypt. Now it has always been supposed that King Neter-khet, whose tomb was found only two miles from Regagnah, was the builder of the 'step-pyramid' at Sakkara. Like his predecessors of the First and Second Dynasties he ultimately determined to be buried in the Thebaid not far from the place most sacred to Osiris, and it seems quite reasonable to suppose that the construction of his remarkable sepulchral monument was carried out by builders and overseers imported for the purpose from Middle or Lower Egypt. To such a colony, we may assume, the little knot of very large-headed men at Regagnah belonged.

CHAPTER X

DETAILED EXAMINATION OF THE PERIODS FROM THE SIXTH TO THE EIGHTEENTH DYNASTIES (INCLUSIVE)

Formulation
of evidence.

THE present chapter deals with some of the most important periods in Egyptian history. It includes series of the Sixth to Twelfth Dynasties from Denderah, of the Twelfth to Fifteenth Dynasties from two sites, viz. Hou and Abydos, and of the Eighteenth Dynasty from two sites, viz. Shekh Ali and Abydos. The method of procedure is the same as that adopted in the last chapter; that is to say all the evidence obtained from the percentage distribution (Table I) and the respective medians (Plates x-xv) is first cited, then the most important points of this evidence are summarized and finally some general deductions are drawn.

UNDIVIDED SERIES. MALES.

(a) *Cephalic Index.* In the Sixth to Twelfth Dynasty males the median for cephalic index is almost identical with that of the Royal Tombs, showing a slight increase on that of the First Dynasty and a considerable increase on that of the Early and the Late Predynastic. The distribution of the percentages agrees with this.

In the next four series the medians swing backwards and forwards. Thus there is a fall at Hou in the Twelfth to Fifteenth Dynasties, but a rise in the same period at Abydos. Then again at Shekh Ali in the Eighteenth Dynasty there is a fall to the level previously found at Hou, but at Abydos in the Eighteenth Dynasty there is another rise to virtually the same figure as that of the Twelfth to Fifteenth Dynasties from Abydos. Throughout these periods the percentage of brachycephaly ranges from 4 to 7 per cent., which is a greater proportion than in the earlier periods; but it is to be remarked that there are no brachycephalic specimens amongst the Eighteenth Dynasty from Abydos, though the deficiency is compensated by a higher percentage of mesaticephaly than occurs in any other period in the history of Upper Egypt.

(b) *Capacity.* In the Sixth to Twelfth Dynasty males the median of capacity has sunk since the First Dynasty, standing midway between the highest and lowest figures hitherto obtained. The percentage of megacephalic specimens, however (37 per cent.), is higher than in any previous period.

In the next four periods the median of capacity swings backwards and forwards in agreement with the rise and fall of the median cephalic index. Similarly at Hou in the Twelfth to Fifteenth Dynasties and at Shekh Ali in the Eighteenth the percentage of megacephalic specimens is less than that of the Sixth to Twelfth, but in the specimens from Abydos of the Eighteenth Dynasty the proportion of megacephalic specimens rises to 54 per cent., which is the highest of any in our Upper Egyptian series. On the other hand, at Shekh Ali in the Eighteenth Dynasty the very high percentage of *microcephaly* is virtually identical with what occurs in the Early Predynastic and in the Roman.

(c) *Vertical Index.* The median for this index shows curious oscillations, so also does the distribution of classes according to percentage.

(d) *Upper Facial Index.* In the Sixth to Twelfth Dynasty males the median for the upper facial index is identical with that of the Royal Tombs and the Early and Late Predynastic, though the percentage of leptoprosopy in the Sixth to Twelfth Dynasties is higher than in any other period throughout this history.

In the four subsequent periods the median hardly changes at all; the Sixth to Twelfth series marks the midway point between such slight variations as do occur. There are no chamaeprosopic specimens in either of the cemeteries of the Twelfth to Fifteenth Dynasties or in the Eighteenth Dynasty series from Abydos. But at Shekh Ali in the Eighteenth Dynasty there are 6 per cent. of chamaeprosopic, which is the highest proportion in any period.

(e) *Nasal Index.* In the Sixth to Twelfth Dynasty males the median for the nasal index has reverted to what it was before the appearance of the refined nose of the males from the Royal Tombs. The distribution of the percentages is in exact agreement with this. Formulation of evidence.

In the four subsequent periods the nose becomes distinctly narrower, approximating very closely to the type seen in the Royal Tombs; indeed at Shekh Ali the median is the lowest which occurs, falling for the first time within the leptorhine class. The proportion of leptorhine specimens correspondingly rises, viz. from 24 per cent. in the Sixth to Twelfth to 44 per cent. in the Twelfth to Fifteenth and to 51 per cent. in the Eighteenth Dynasty of Shekh Ali, though there is a drop to 40 per cent. in the Eighteenth Dynasty of Abydos. As a rule there is a simultaneous fall in the percentage of platyrhiny.

(f) *Orthognathism and Prognathism.* In the Sixth to Twelfth Dynasty males the distribution of the classes of Orthognathism and Prognathism corresponds closely to that seen in the Late Predynastic.

The Hou specimens of the Twelfth to Fifteenth Dynasties have a higher percentage (16 per cent.) of prognathism than any period except the Early Predynastic, and there are more prognathic males than females, which is unusual. The percentage of prognathism is also high in the Shekh Ali specimens of the Eighteenth Dynasty (13), but there are no examples of prognathism in the Abydos cemetery of the same date.

There is, however, a general decrease in the prognathism of the population throughout these periods in comparison with those considered in the last chapter (see arithmetical means in Chart I).

UNDIVIDED SERIES. FEMALES.

(a) *Cephalic Index.* In the Sixth to Twelfth Dynasty females the median of the cephalic index is identical with that of the Royal Tombs, and higher than in the three earliest periods. This is a result similar to that obtained for the males, and is in agreement with the percentage distribution, which shows an increase in the proportion of mesaticephalic and brachycephalic examples.

Of the subsequent series those from Hou and Shekh Ali have the same median as the Sixth to Twelfth Dynasties, but the two Abydos cemeteries agree in exhibiting a rise of one unit. The percentage distribution of the females from these two Abydos cemeteries is nearly identical; and in the Eighteenth Dynasty Abydos series the percentage of mesaticephals (63) is higher than in any other period throughout the history.

In comparing the sexes it is to be noted that the median in the females of Hou and Shekh Ali does not fall. Both the median and the distribution of percentages show the females increasingly more brachycephalic than the males.

(b) *Capacity.* In the Sixth to Twelfth Dynasties the median of cranial capacity in the females has reverted to where it stood in the first three periods, having decreased from what it was in the Royal Tombs (cf. the fall in the capacity of the males). The percentage distribution is in accordance with this result.

In the subsequent periods just as occurred with the cephalic index, the median of capacity at Hou and at Shekh Ali is identical with that of the Sixth to Twelfth Dynasties, but there is a rise in the two Abydos cemeteries. The percentage distributions, however, show that Hou has the largest percentage (93 per cent.) of microcephalic females of any period; whereas in the males it was at Shekh Ali that the greatest proportion of microcephaly occurred. Judged by the percentage distribution, the Shekh Ali females are not much inferior in capacity to the Abydos females of the same date and are actually superior to the Abydos females of the Twelfth to Fifteenth Dynasties.

(c) *Vertical Index.* The most noteworthy point is the marked rise in the percentage of acrocephalic specimens seen in the Sixth to Twelfth Dynasties and in the Abydos series of the Twelfth to Fifteenth Dynasties. In these the proportion of females with high vaults is greater than at any other time in the whole history.

In respect of the vertical index the Hou specimens of the Twelfth to Fifteenth Dynasties with 5 per cent. of acrocephals stand in marked contrast to those from Abydos, of which 25 per cent. are acrocephalic. In the Eighteenth Dynasty the percentage of acrocephalic specimens falls again, viz. at Shekh Ali to about half what it was in the Sixth to Twelfth Dynasties and at Abydos still lower. It may be remarked that at Abydos in the Eighteenth Dynasty there are more tapeinocephalic males than females, which has not been the case in any previous period.

(d) *Upper Facial Index.* In the Sixth to Twelfth Dynasties the face of the women is one unit longer than it was in the series from the Royal Tombs, $1\frac{1}{2}$ units longer than in the Late Predynastic and First Dynasty, and is identical with what it was in the Early Predynastic.

Formulation
of evidence.

In the Twelfth to Fifteenth Dynasties the facial index is virtually the same as in the Sixth to Twelfth both in regard to the median and to the percentage-distribution.

In both sites of the Eighteenth Dynasty, however, the face is appreciably shorter, and similarly the percentage of leptoprosopic specimens has decreased. As in the male series of the Eighteenth Dynasty from Shekh Ali so also in the females chamaeprosopic examples occur.

(e) *Nasal Index.* In the Sixth to Twelfth Dynasties the nose of the women is one unit broader than in those from the Royal Tombs, and is the same as it was in the Early and in the Late Predynastic periods.

Of the succeeding periods it is to be remarked that the nose becomes rather narrower in both the Abydos cemeteries and a unit and a half narrower at Shekh Ali. This is in agreement with the distribution of specimens, which shows a general rise in the proportion of leptorhiny, reaching its highest percentage at Shekh Ali just as it did in the males.

Orthognathism and Prognathism. In the Sixth to Twelfth Dynasties the distribution of Prognathism closely resembles that seen in the First Dynasty. It is to be noticed that the females of the Twelfth to Fifteenth Dynasties at Hou do not exhibit the same remarkable proportion of Prognathic specimens as the males. In the Eighteenth Dynasty the percentage of prognathism at Shekh Ali is high for the females, just as it was for the males; it is also high at Abydos, in marked contrast to the male series, in which prognathism does not occur at all.

The general decrease in prognathism throughout these periods is a point not to be overlooked (see the arithmetical means as given in the supplement, Chart II).

DIVIDED SERIES. THE SEPARATE RACE-STOCKS.

The representation of the two stocks (excluding intermediates, for which see p. 135) for these periods and on these sites is as follows:—

	Group I. Males. (Negroid.)	Group I. Females. (Negroid.)	Group II. Males. (Non-negroid.)	Group II. Females. (Non-negroid.)
	Per cent.	Per cent.	Per cent.	Per cent.
Sixth to Twelfth Dynasties	20½	13½	54	47½
Twelfth to Fifteenth Dynasties from Hou . .	20	16	62	47
Twelfth to Fifteenth Dynasties from Abydos .	—	16	(9 examples)	48½
Eighteenth Dynasty from Shekh Ali	22	15½	59	52½
Eighteenth Dynasty from Abydos	16½	19	63	54

GROUP I (Negroid). *Males.* In the Sixth to Twelfth Dynasties the characteristics of Group I closely approximate to what they were in the First Dynasty in respect of cranial capacity, upper facial, and nasal indices. But the cephalic index is 1½ units lower.

In regard to upper facial and nasal indices the Sixth to Twelfth negroids show little change since the Early and Late Predynastic; in respect of cranial capacity the median of the Sixth to Twelfth is identical with the Late Predynastic and higher than the Early. The cephalic index is two units higher than in Early Predynastic, 1½ units higher than the Late Predynastic.

In the Twelfth to Fifteenth Dynasties from Hou Group I is present in its most pronounced form. It exhibits the highest degree of platyrhiny of any period, though in respect of capacity and cephalic index the figures are intermediate between those representative of the several earlier periods; and the facial index displays little divergence.

Compared with the Twelfth to Fifteenth Dynasty specimens from Hou those of the Eighteenth Dynasty from Shekh Ali display a remarkable fall in the median of the nasal index and furnish the only example in this Group of an average type which falls just within the limits of mesorhiny. The facial index in the Eighteenth Dynasty from Shekh Ali also falls, viz. by a unit and a half. In other respects the characters of this Group are much the same in the two periods. The representatives of Group I in the Eighteenth Dynasty at Abydos, few though they are, closely conform to the characteristics of this group displayed in the Sixth to Twelfth Dynasties. The apparent rise in cranial capacity rests on doubtful evidence, as the eight specimens composing the group are scattered widely over the scale.

GROUP I (Negroid). *Females.* In the females of the Sixth to Twelfth Dynasties the median of cranial capacity is higher than in any of the previous periods. The cephalic index also exceeds that of all previous periods, except only the Early Predynastic, the facial index remains stable at the point which it had reached in the Late Predynastic, whilst the nose is wider by one unit than the widest previously reached (viz. Early Predynastic).

In the specimens from Hou of the Twelfth to Fifteenth Dynasties the cranial capacity drops to 1,200 cc., while the cephalic index only falls by half a unit. The nose, however, suddenly narrows by $3\frac{1}{2}$ units and falls within the mesorhine division; the facial index remains unaltered. Formulation of evidence.

In the specimens from Abydos of the same period the cranial capacity rises again by 50, a change which is accompanied by a rise in the cephalic index of one unit. The face is longer by one unit than in the specimens from Hou, and the nose is wider by two units. The specimens from Shekh Ali of the Eighteenth Dynasty are identical with those of the Fifteenth Dynasty from Abydos, except in respect of the cephalic index, which is two units lower. In the Eighteenth Dynasty from Abydos there is a rise of 90 cc. in the capacity (which in this case is more trustworthy than the apparent rise in the males of the same period and site), which is accompanied by a rise of two units in the cephalic index above that of the Shekh Ali specimens. With respect to facial index the Abydos specimens are shorter by a unit than those from Shekh Ali, while the nasal index remains virtually the same.

GROUP II (Non-negroid). *Males.* The males of Group II in the Sixth to Twelfth Dynasties most closely resemble those of the Early Predynastic, differing from them only in their slightly greater cranial capacity and slightly wider nose. They differ from the First Dynasty in having a longer face, such as is characteristic of the two earliest periods. As compared with those from the Royal Tombs the males of the Sixth to Twelfth Dynasties have a slightly longer face and a wider nose.

In the specimens from Hou of the Twelfth to Fifteenth Dynasties there is a fall in the cranial capacity accompanied by a fall in the cephalic index; the nasal aperture is two units narrower. In the Twelfth to Fifteenth Dynasties from Abydos the wide range over which the nine specimens of the group are distributed makes the apparent rise in the median of capacity somewhat doubtful, though there is an undoubted rise in the cephalic index of $1\frac{1}{2}$ units; the facial and nasal indices in this series fall on the limits dividing mesorhiny from platyrhiny and mesoprosopy from leptoprosopy.

The specimens from Shekh Ali of the Eighteenth Dynasty resemble rather the Hou than the Abydos specimens of the Twelfth to Fifteenth Dynasties, though they are somewhat shorter-faced and wider-nosed.

The specimens of the Eighteenth Dynasty from Abydos seem more closely allied to those of the Twelfth to Fifteenth Dynasties from Abydos than to those of the Twelfth to Fifteenth Dynasties from Hou. They agree, however, with the Eighteenth Dynasty series of Shekh Ali as regards their facial and nasal indices.

GROUP II (Non-negroid). *Females.* In the Sixth to Twelfth Dynasties the females of Group II have a cranial capacity equal to that of the Late Predynastic females of the non-negroid group, and have a corresponding cephalic index. But the cranial capacity is considerably lower than during the First Dynasty or at the Royal Tombs (probably in consequence of a decrease in stature, see the femoral lengths on p. 88), though the cephalic index is higher than in either of those periods. The face-length is identical with that found under the First Dynasty and at the Royal Tombs, being somewhat shorter than that of the Early Predynastic, and two units longer than that of the Late Predynastic. The nasal index is mesorhine, but does not vary from what it was in the early periods by more than one unit and a half.

The specimens from Hou of the Twelfth to Fifteenth Dynasties may be said to be identical with those of the Sixth to Twelfth Dynasties, though slightly (one unit) narrower in the nose.

The Abydos Twelfth to Fifteenth Dynasty specimens are distinctly superior to those of Hou or of the Sixth to Twelfth Dynasties in respect of cranial capacity and cephalic index. The median for the cephalic index is 77, which is mesaticephalic and the highest of any Group in any period. There is virtually no difference in the facial or nasal indices between these and the specimens from Hou.

In the Shekh Ali examples of the Eighteenth Dynasty there is a fall in the median of the cranial capacity and of the cephalic index bringing them into agreement with the Twelfth to Fifteenth Dynasties from Hou and the Sixth to Twelfth Dynasties. The median of the facial index shows a shorter face than in any other period except the Late Predynastic. The nasal index varies little in the females of the non-negroid group throughout their whole history.

There is very little difference between the cranial capacity of the females from Abydos of the Eighteenth Dynasty and of those from Shekh Ali at the same period, though the former display a slight rise in the cephalic index ($75\frac{1}{2}$) which brings them within the mesaticephalic division. It is noteworthy, however, that the cranial capacity of the non-negroid women at Abydos is much inferior to that of the negroid; a characteristic which also appeared, though less markedly, in the Sixth to Twelfth Dynasties. The face at Abydos is one unit longer and the nose is a unit and a half broader than at Shekh Ali.

Formulation
of evidence.

The medians of the vertical index and of ortho-prognathism in the several periods are as follows:—

	Males of Group I. (Negroid.)	Males of Group II. (Non-negroid.)	Females of Group I. (Negroid.)	Females of Group II. (Non-negroid.)
VERTICAL INDEX:				
Sixth to Twelfth Dynasties . .	74½	74	74½	74
Twelfth to Fifteenth Dynasties from Hou . .	73	72½	70½	72
Twelfth to Fifteenth Dynasties from Abydos .	—	73?	73!	74
Eighteenth Dynasty from Abydos	72½	71½	73	71½
Eighteenth Dynasty from Shekh Ali	71	73	73	72½
ORTHO-PROGNATHISM:				
Sixth to Twelfth Dynasties	BC to C	A B to B	BC	B
Twelfth to Fifteenth Dynasties from Hou . .	C to CD	A B	C	A to A B
Twelfth to Fifteenth Dynasties from Abydos .	—	A B	—	A to A B
Eighteenth Dynasty from Abydos	A B to B	A to A B	A B to B	B
Eighteenth Dynasty from Shekh Ali	C to CD	B	C	B

The most
significant
points in the
evidence
formulated
above.

The most significant points in the evidence formulated above are the following:—

IN THE MALES.

Cephalic Index and Capacity. In the seriation of the entire population the two Abydos cemeteries agree in having a higher median of cephalic index, while Shekh Ali and Hou agree in having a lower. The cephalic index is maintained in all four series at the level reached in the First Dynasty, which is higher than that of the Early and the Late Predynastic.

The percentage of mesaticephals and of brachycephals has increased in general, though the Shekh Ali series forms an exception.

There has been a continuous rise in the percentage of megacephals from the Early Predynastic period to the end of the Twelfth Dynasty. This is followed by a fall in the percentage at Shekh Ali (Eighteenth Dynasty) and at Hou (Twelfth to Fifteenth) and then by a rise to the highest point of all at Abydos (Eighteenth). These changes are correlated with a corresponding rise and fall of the cephalic index.

Next, to examine the individual race-stocks. In these it appears that the cephalic index oscillates slightly both in the negroid and in the non-negroid group; but the oscillation is in general harmonious, not being greater for the one race than for the other. In comparison, however, with the early times it should be noticed that the cephalic index of the negroid males has decreased from what it was in the First Dynasty. The non-negroid group has a very slightly higher cephalic index than the negroid in all these series except that of Hou (Twelfth to Fifteenth Dynasties). The statements that have been made as to the cephalic index of the two groups are equally applicable to the cranial capacity, except only that in the Eighteenth Dynasty at Abydos the cranial capacity is equal for both.

Facial and Nasal Indices and Prognathism. In the seriation of the entire population the two extremes of facial type are found in the two Eighteenth Dynasty series, since at Abydos there are no chamaeprosopic examples, while at Shekh Ali there are more than in any other period (viz. 6 per cent.).

In regard to the nose the extreme leptorhiny of the Shekh Ali specimens is remarkable.

The great amount of prognathism at Hou (Twelfth to Fifteenth Dynasties) and the complete absence of it at Abydos must be noted. The general movement, moreover, of the ortho-prognathic median towards orthognathism after the Predynastic periods is significant (see arithmetical means in Chart I).

The most significant points in the evidence formulated above.

When the individual race-stocks are examined it is seen that the difference between them in facial index is least at Abydos in the Eighteenth Dynasty. The contrast in the nasal index of the two races again is more pronounced at Hou than anywhere else; and in general the opposition of negroid and non-negroid in respect of facial characteristics is more clearly defined at Hou than in any other series throughout the history.

The median of ortho-prognathism is consistently about two points more prognathic in the negroid than in the non-negroid, until Abydos in the Eighteenth Dynasty where there is only one point's difference (viz. from A and AB to AB and B).

IN THE FEMALES.

Cephalic Index and Capacity. In the seriation of the entire population the rise in cephalic index during the three earliest periods is maintained between the Sixth and Eighteenth Dynasties. Indeed there is actually a progressive advance at Abydos both in the Twelfth to Fifteenth and in the Eighteenth Dynasties, though not on the other sites. Thus there would seem to be some evidence of a grouping dependent on social rank, inasmuch as the women of what was at any rate not the richest class in the Twelfth to Fifteenth Dynasties (cf. the remarks below) resemble those of the poorer class of the Eighteenth Dynasty; whereas the two Abydos cemeteries, which at this date were probably monopolized by the superior classes, agree in exhibiting a higher cephalic index.

The same remarks are applicable to the cranial capacity.

As for the individual race-stocks there is the same harmony in the rise and fall of the cephalic index of the two groups as was observed in the males. The only exception is in the series of the Twelfth to Fifteenth Dynasties from Abydos, where the non-negroid stock has a median cephalic index two units higher than the negroid.

In both series of the Twelfth to Fifteenth Dynasties the capacity of the non-negroids exceeds that of the negroids; but the reverse is seen in the Sixth to Twelfth Dynasties, and at Abydos in the Eighteenth Dynasty, which are the only two cases until the Roman period in which the negroid women are noticeably superior in cranial capacity. At Shekh Ali the two groups are identical in respect of this feature.

Facial and Nasal Indices and Prognathism. In the Sixth to Twelfth Dynasties and in the Twelfth to Fifteenth Dynasties (both sites) the facial index reverts to exactly what it was in the Early Predynastic period. But in the Eighteenth Dynasty (both sites) the face shortens, as it did in the Late Predynastic period and in the First Dynasty.

The nasal index in the Sixth to Twelfth Dynasties reverts, like the facial index, to the type seen in the Early Predynastic period. On the other hand the Abydos females of both periods are characterized, in spite of the shortening of the face, by narrower noses. The Shekh Ali females resemble their contemporaries of the Eighteenth Dynasty at Abydos in nasal as well as in facial index, though they are so different from them in cephalic index and capacity, a result similar to that noted in the males.

The progressive decrease in prognathism (see arithmetical means in Chart II) is noteworthy. And it is also worth remarking that there is a greater number of prognathic females than males at Abydos in the Eighteenth Dynasty.

The most significant points in the evidence formulated above.

Review of the physical history from the Sixth to the Eighteenth Dynasties.

In the two different race-stocks the contrast of facial index is most pronounced at Hou (Twelfth to Fifteenth Dynasties) and least at Shekh Ali (Eighteenth Dynasty). Conversely the difference in the width of nose is least at Hou and greatest at Shekh Ali.

The median of ortho-prognathism is consistently more prognathic in the negroid than in the non-negroid females.

To resume the thread of the direct physical history after the interruption noticed in the Third and Fourth Dynasties. A long interval, perhaps between one and two thousand years, separates the series of the First and Second Dynasties from that of the Sixth to Twelfth. And from the evidence which has been cited in the preceding paragraphs it would seem that the population of the Thebaid has undergone certain changes in the interval. The juxtaposition of opposite races still persists, and in the men their proportionate representation is very much the same as it was before. The characteristics of the male population in general are very little altered, and the non-negroid stock amongst them has undergone no appreciable modification. In the negroids, however, there is evidence that the head is becoming slightly rounder, a modification which is directly correlated with the observed increase in the height of the vault.

In the females the negroid element is represented by a much smaller proportion than in the immediately preceding periods; but our series shows this race-stock, though numerically weak, yet with all its characteristics well pronounced. In the non-negroid stock the first point to be remarked is the considerable reduction in stature, as judged by the femoral length, which is a centimetre and a half less than it was in the Predynastic periods. Were this reduction unassociated with any change in the cranial capacity it would be expected that the women would prove to have rounder heads. As a matter of fact the cephalic index *has* increased, but we are faced with the difficulty that the capacity has not increased but has decreased since the First Dynasty. So that the increase in the roundness of the head must be accounted for by an increase in the height of its vault¹; and this suggestion is in complete accordance with the facts recorded, namely a notable increase in the percentage of women with high vaults in the general population.

It is perhaps worth suggesting that the diminution in the robustness of the women, as shown by the decrease in their stature, may possibly be connected with an alteration in their habits of life, such as would take place in the transition from a state in which the struggle for existence obliged the females to share the labours of their husbands to a state in which the respective spheres of activity of the two sexes had been more exactly defined.

Before proceeding to discuss the nature of the four succeeding series it will be well to eliminate an exceptional group of specimens which undoubtedly constitute a foreign colony. They belong to the Twelfth to Fifteenth Dynasties and are included in the tabulation of the other examples of that date from Hou. The graves from which they were obtained have been described in Chapter I, and it is sufficient to recall that the burial customs and the tomb-equipment were quite unlike those of the native Egyptians of the same period. It is therefore very interesting to find that the physical attributes of the people buried in these so-called 'Pan-graves' completely corroborate the archaeological evidence of an intrusive race-element. The catalogue-numbers may be readily identified in Charts I G and II G; they are 101-115 for the males and 102^A-110 for the females. The measurements reveal a remarkable homogeneity and the males in particular exhibit a strongly-marked racial type. The cephalic index of the six male specimens is uniformly

¹ See *Journ. Anthropol. Inst.*, vol. xxxiii, p. 165.

low and in every case below the average of the general population of the time, while their vertical index is at the same time higher than the average. None of the males are orthognathic, two are extremely prognathic; and the only specimens in which the nose could be observed were very platyrrhine. The eight male femora available for measurement gave a median of 466 mm. to 480 mm., which is at least a centimetre and a half longer than the typical femur of the contemporary natives.

Review of
the physical
history from
the Sixth
to the
Eighteenth
Dynasties.

The circumstance that this knot of individuals displays characteristic negroid features taken in connexion with their proved association with a particular style of pottery manufacture appears to justify us in the assumption that the ware referred to was made by this, a negroid, people. Now the same highly peculiar ware and the same unusual style of grave have up to the present only been met with in the Early Predynastic time. It seems therefore quite a reasonable conjecture that the makers of this pottery in the Early Predynastic period were a negroid people of the same strain as that found in this colony of Twelfth Dynasty date; though, on the other hand, it is possible that these immigrants merely brought back an art which they had originally learned from their non-negroid neighbours but which the latter had forgotten.

In considering the succeeding series, viz. two of the Twelfth to Fifteenth Dynasties and two of the Eighteenth, it becomes evident that we have to deal with two sections of the population which were differentiated by the social conditions of the time. In each of the periods represented (Twelfth to Fifteenth and Eighteenth Dynasties) the specimens examined are taken from two distinct cemeteries, though the distance separating the sites is not many miles. Now the remarkable fact appears that in the examples obtained from the cemeteries at Abydos the median of the cranial capacity is 100 cc. greater for the males than it is in those obtained from either Hou (Twelfth to Fifteenth Dynasties) or Shekh Ali (Eighteenth Dynasty). Correspondingly the heads of the Abydos people are slightly rounder than those of the inhabitants of Hou and Shekh Ali. Unfortunately there are no data by which to gauge any differences of stature which may have existed between the two social classes, but the fact that the increase in the cranial capacity of the Abydos people is correlated with a rise in the cephalic index justifies us in assuming that probably there was little if any difference in this respect. Such an increase in the cranial capacity might reasonably be ascribed to higher culture and a more refined manner of life.

The general population at Hou (Twelfth to Fifteenth Dynasties) and at Shekh Ali (Eighteenth Dynasty) conforms fairly closely to that of the earlier periods, whilst the general population of Abydos resembles rather the people buried in the Royal Tombs of the First and Second Dynasties. It will be useful therefore to consider here what archaeological evidence there is which may bear upon these points.

Every archaeologist is aware that Abydos was the most sacred place in ancient Egypt for all the worshippers of Osiris. To be buried there in the neighbourhood of his god was the ambition of every pious person, but naturally such a privilege was beyond the hopes of the very poor, and, as the space in the cemeteries decreased, was more and more restricted to the wealthier sections of the community. At Shekh Ali, on the other hand, the individuals who were thrown promiscuously into a pit without any of the accessories of tomb-furniture were probably either paupers or at the least persons of an inferior class. Those who were buried at Hou were no doubt of better standing, but the equipment of the tombs and the unostentatious style of their construction suggest that their owners belonged only to such a bourgeois class as was found at Denderah in the preceding period.

Review of
the physical
history from
the Sixth
to the
Eighteenth
Dynasties.

In the females the differences between the social classes are less pronounced than in the males, but they are of precisely the same nature. At Abydos for the first time the median of the female cephalic index falls within the mesaticephalic division.

It is to be noted that the negroid element is not confined to one social class, for the proportion of negroid males at Abydos is only slightly less than on the other two sites. In the females the proportion is actually greater at Abydos, which suggests that the women of the negroid stock shared with others of their sex the favours of the nobles and high officials.

In the separate race-stocks the non-negroid males exhibit medians of cranial capacity and cephalic index either equal to or slightly in advance of the negroid. The same is true of the females, except at Abydos in the Eighteenth Dynasty, where the median cranial capacity of the negroid women exceeds that of the non-negroid by 80 cc. This is in harmony with the opinion just expressed that these women were specially selected on account of their physique and accomplishments. In regard to the facial features amongst the males, the two stocks are most widely differentiated at Hou, where the negroid element exists in a very pronounced form; this is partly to be explained by the inclusion of the pure-blooded negro element ('Pan-graves') to which reference has already been made. There is a closer assimilation of the opposite types with regard to the nasal index in the Shekh Ali males (Eighteenth Dynasty), and with regard to the facial in those of the Eighteenth Dynasty at Abydos. It is noteworthy that among the females the strongest contrast between the opposed groups is not found (as it was among the males) at Hou but in the two series from Abydos. In regard to facial projection the negroid stock is consistently more prognathic than the non-negroid.

CHAPTER XI

DETAILED EXAMINATION OF THE PTOLEMAIC AND ROMAN PERIODS

THE present chapter deals with the Ptolemaic and Roman periods, thus carrying the physical record from the end of the fourth century before Christ down to the time of the Mohammedan conquest. The method of procedure is the same as that adopted in the last two chapters, first the whole evidence is formulated (cf. Table 1 and Plates x-xv), then the most important points in it are summarized, and lastly some general conclusions are drawn.

UNDIVIDED SERIES. MALES.

(a) *Cephalic Index.* In the Ptolemaic period the percentage distribution of dolichocephaly, mesaticephaly and brachycephaly, and the median of the cephalic index are not conspicuously different from those of several other series. Formulation of evidence.

In the Roman period the median of the cephalic index is higher than at any other time in the history, falling indeed just within the mesaticephalic division. Similarly there is an increase in the percentage of brachycephals and a decrease in that of dolichocephals.

(b) *Capacity.* The medians of the Ptolemaic and Roman periods are identical with those of the Late Predynastic and Early Predynastic respectively. Thus they also resemble the Eighteenth Dynasty from Shekh Ali and the Twelfth to Fifteenth Dynasties from Hou, while they are in striking contrast to the Eighteenth Dynasty from Abydos.

The Roman period, which has a median 20 cc. lower than the Ptolemaic, has, correspondingly, 12 per cent. more microcephalic specimens. The fact that the fall in capacity in the Roman period is yet accompanied by a rise in the cephalic index is possibly associated with the increase in the percentage of acrocephalic examples; with regard to stature the data are too scanty to allow of any inferences.

(c) *Vertical Index.* In the Ptolemaic period the percentage of males with low vaults is higher than in any other. Similarly the arithmetical mean (see supplement, Chart I M) is the lowest which occurs for this index at any time except the Thirtieth Dynasty.

Among the Roman males there are 6 per cent. more examples with high vaults than among the Ptolemaic. There are 5 per cent. fewer with low vaults, but in spite of this the Roman series has the second highest percentage of low vaults which occurs.

(d) *Facial Index.* The median of the facial index in the Ptolemaic period falls within the mesoprosopic division, which otherwise has only happened in the First Dynasty and in the Thirtieth Dynasty. Similarly the percentage-distribution shows less leptoprosopy than in any period.

In the Roman period the median is, as formerly, within the leptoprosopic division and correspondingly there are 8 per cent. more leptoprosopic specimens than in the Ptolemaic series.

(e) *Nasal Index.* In the Ptolemaic period the median is the same as in the Eighteenth Dynasty from Abydos. The percentage-distribution, however, is different, showing a smaller proportion of leptorhine specimens than in any period subsequent to the Twelfth Dynasty.

In the Roman period the median remains virtually unchanged from what it was in the Ptolemaic; but there is a slightly higher percentage at once of leptorhiny and of platyrhiny.

(f) *Orthognathism and Prognathism.* In the Ptolemaic period the percentage of prognathic specimens is lower than in any previous time except at Abydos in the Eighteenth Dynasty.

Among the Roman males prognathism is entirely absent.

In both periods there is more hyperorthognathism than at any previous point in the history.

UNDIVIDED SERIES. FEMALES.

Formulation
of evidence.

(a) *Cephalic Index*. In the Ptolemaic period the median of the cephalic index for the women is identical with that of the Twelfth to Fifteenth and of the Eighteenth Dynasties at Abydos, and is higher than in any of the other series. The proportion of brachycephals is higher than in any period and is 11 per cent. above that of the males.

In the Roman period there are 6 per cent. fewer brachycephals among the females than among the males, and the proportion of brachycephals is not appreciably greater than among the females of various other series. On the other hand the *median* of cephalic index for the females is the same as that of the males, whereas in the Ptolemaic and in all the other series the females have been in varying degrees more brachycephalic than the males. (That is to say it is the Roman *males* that have increased in brachycephaly.)

(b) *Cranial Capacity*. The capacity of the females has in general varied very slightly, and it remains in the Ptolemaic period much the same as it has been throughout the history, except only in the Royal Tombs and in the series of the Twelfth to Fifteenth and of the Eighteenth Dynasties from Abydos.

The Roman females, whether judged by the median or by the percentage-distribution, are the most microcephalic of any except those of Hou. The scanty data with regard to stature seem to suggest an explanation of this diminished cranial capacity.

(c) *Vertical Index*. The Ptolemaic and Roman females are much less tapeinocephalic than the males, but there is not otherwise anything to remark with regard to this index.

(d) *Facial Index*. Though the medians of this index in the Ptolemaic and Roman series show no appreciable difference from those of preceding periods, yet it is to be noted that among the Ptolemaic females (as among the males) there is a smaller proportion of leptoprosopic specimens than at any other time, and among the Roman females there is a larger proportion of chamaeprosopic specimens than at any other time.

(e) *Nasal Index*. In the Roman period the females are $2\frac{1}{2}$ units broader-nosed than the males, while in the Ptolemaic period they are only $1\frac{1}{2}$ units broader-nosed than the males.

The proportion of platyrrhine specimens in the women of the Ptolemaic period is maintained at the usual level, but in the Roman time there is an increase of 8 per cent. in the platyrrhine examples, which gives a larger proportion of broad-nosed women to this than to any period except the First Dynasty.

(f) *Orthognathism and Prognathism*. There are fewer prognathic specimens and there is a lower arithmetical mean (Chart II M) for this feature among the Ptolemaic women than among those of any other period, except the Twelfth to Fifteenth Dynasties at Abydos and the Thirtieth Dynasty.

Among the Roman women, on the other hand, there are 5 per cent. more prognathic examples than among the Ptolemaic, 9 per cent. of the whole series being prognathic. This forms a striking contrast to the Roman males, among whom there were no prognathic specimens.

DIVIDED SERIES. THE SEPARATE RACE-STOCKS.

The proportionate representation of the two stocks in these periods is—

	Group I. Males. (Negroid.)	Group I. Females. (Negroid.)	Group II. Males. (Non-negroid.)	Group II. Females. (Non-negroid.)
	Per cent.	Per cent.	Per cent.	Per cent.
Ptolemaic . .	14	$30\frac{1}{2}$	$48\frac{1}{2}$	43
Roman . . .	20	25	$52\frac{1}{2}$	41

Proceeding to consider them in detail we find the following results:—

GROUP I (Negroid). *Males*. In the Ptolemaic period this race-stock differs little from what it was at Abydos in the Eighteenth Dynasty and at Denderah in the Sixth to Twelfth Dynasties. In the Roman period, however, it is remarkable for the rise in its cephalic index, and for the fall in its upper facial index, which shows a shorter face than has occurred in any other period. The nasal index remains the same as in the Ptolemaic period; and the capacity is not only 30 cc. higher than in the Ptolemaic time, but surpasses that of the contemporary non-negroid stock by 50 cc. which is exceptional.

This remarkable rise in the cephalic index is obtained from a series which is certainly small, comprising only eight specimens. But the rise is even more conspicuous than is suggested by the mere figure of the median, for only one of the specimens has a cephalic index under 74, while three have such exceptional indices as 83 and 84. The catalogue-numbers of the specimens in question are 487, 496, 509, 512, 516, 542, 547, 564, and their other features may readily be ascertained by reference to the supplement (Chart I N). It will then be found that five out of the eight are platyrrhine, which is an important point.

Formulation of evidence.

GROUP I (Negroid). *Females*. The negroid females of the two periods are identical in their characteristics, and as regards cephalic, facial, and nasal indices they correspond to those of the Eighteenth Dynasty at Abydos.

GROUP II (Non-negroid). *Males*. In the Ptolemaic period the non-negroid males differ little from those of the Eighteenth Dynasty at Abydos.

In the Roman series, however, this stock is characterized by a longer face and a narrower nose. It may be remarked again that the non-negroid stock is longer-headed and has a less cranial capacity than the negroid in this period.

GROUP II (Non-negroid). *Females*. There is little difference between the non-negroid females of the Ptolemaic and Roman periods except in respect of capacity. They conform pretty closely to the type as it is observed in the Eighteenth Dynasty.

In the Roman period the non-negroid females—like the non-negroid males—have a less capacity and a slightly lower cephalic index than those of the negroid stock, though the difference is not so pronounced.

The medians of the vertical index and of ortho-prognathism for the two separate stocks are as follows :—

	Group I. Males. (Negroid.)	Group I. Females. (Negroid.)	Group II. Males. (Non-negroid.)	Group II. Females. (Non-negroid.)
VERTICAL INDEX :				
Ptolemaic	70	72	71½	72
Roman	78½	78½	72	72
ORTHO-PROGNATHISM :				
Ptolemaic	B	B	A	A to A B
Roman	A B	C	—A to A	A B

The most significant points in the evidence formulated above are the following :—

The most significant points in the evidence formulated above.

IN THE MALES.

In the seriation of the whole population for these two periods the males of the Roman time, as contrasted with those of the Ptolemaic, were rounder headed, had a slightly lower cranial capacity with a higher percentage of microcephals, were narrower faced, and were never prognathic.

The males of the Ptolemaic period conform more closely than those of the Roman to the average type of the various preceding series, differing, however, in being slightly broader faced and having lower vaults.

As regards nasal form there is no difference between the two periods. There is a higher percentage of very straight faces in both periods than in any other throughout the history.

If the two race-stocks are then examined individually, it will appear that in the Ptolemaic time the negroid and non-negroid groups display the same characteristics which distinguished them in the preceding periods.

In the Roman time, however, the differences between them are emphasized by the introduction of apparently new characteristics. Thus the platyrrhine negroid stock has

The most significant points in the evidence formulated above.

a cephalic index and a cranial capacity much higher than that of the non-negroid. The face also has become shorter. The non-negroid stock, on the other hand, has become distinctly longer-faced and narrower nosed.

IN THE FEMALES.

In the seriation of the entire population the females of these two periods closely resemble each other in most respects. But while the cranial capacity in the Ptolemaic time stands at a figure corresponding to the general average of the preceding periods, the women of the Roman period are, whether judged by median or by percentage-distribution, the most microcephalic in the whole history. The proportion of round heads is greater among the women than among the men in the Ptolemaic time; but this distinction does not hold any longer in the Roman, for, while the females of that time remain at the same level, the males have become rounder headed. In both periods the women have not such low vaults as the men, and in both they are broader nosed, the difference being greatest in the Roman time. The proportion of broad-nosed women in the Roman period is greater than in the Ptolemaic, and indeed greater than in any series except the First Dynasty. The proportion of long faces in the Ptolemaic period is less than at any former time, and the proportion of broad faces is greater in the Roman period than ever before. Finally, while there are no prognathic males yet there is a considerable proportion of prognathic females in the Roman time: this may be regarded as a somewhat unusual circumstance since the majority of prognathic examples is commonly found among the males.

If the two race-stocks are examined individually, it will be seen that the diminution in the cranial capacity of the general female population in the Roman time is confined to the non-negroid and the intermediate racial elements. The median of capacity in the non-negroid is appreciably lower than in the negroid stock, and whereas none of the negroids have heads of less than 1,150 cc. capacity, five out of the eighteen composing the non-negroid group are below that figure.

Review of the physical history in Ptolemaic and Roman times.

A lapse of a thousand years separates the earliest of the two periods dealt with in the present chapter from the Eighteenth Dynasty. During this interval the fortunes of Egypt had steadily declined; and now the end of the fourth century before Christ witnessed the permanent establishment of a foreign domination, which has lasted in spite of many changes of masters until the present day.

We possess a very small series of specimens belonging to the Thirtieth Dynasty, which immediately precedes the Ptolemaic in point of date. Of these it need only be remarked that both race-stocks are represented, and that the non-negroid (of which alone there are sufficient examples to form any estimates) shows no characteristics to differentiate it from the average non-negroid type as seen in preceding series.

In the Ptolemaic and Roman times the same two racial elements appear which have been observed throughout from the very beginning of the history, and in the Ptolemaic period there is no evidence that their respective characteristics have undergone any appreciable modification. In the Roman, however, it is impossible to avoid being struck by the remarkable rise in the cranial capacity and cephalic index of the negroid males. The occurrence of such individuals, however, with large and rounder heads, and presumably therefore representing a superior type, is not inconsistent with the conditions of the time. History indicates that Nubia had long since attained a high standard of civilization; under the later Ptolemies it successfully asserted its independence, and throughout the

Roman occupation of Egypt the Thebaid was perpetually menaced with attack from that quarter.

Review of
the physical
history in
Ptolemaic
and Roman
times.

At the same time the non-negroid element in the male population seems to have undergone a change, which is shown by the narrower face and finer nose as well as by the straighter profile. Nevertheless in spite of these refinements the cranial capacity of these men is lower and their heads are slightly more elongated than those of the negroids just mentioned. As there is a particularly noticeable reduction in the cranial capacity of the non-negroid females, for whom there is some evidence to suggest that it is due to a reduction in stature, it is possible (in the absence of any data bearing upon the point) that the same explanation may hold in the case of the males. If so, such a reduction of stature, taken in connexion with the modification of the facial features, might be regarded as a hint of the influence exercised by a foreign Mediterranean type, which at this date could easily have come into Upper Egypt from the north. It is only remarkable that the numerous non-indigenous races, of whose settlement there is documentary evidence, have not left more recognizable traces on the general population, in which the same elements remain preponderant at the end of the Roman period as at the beginning of the whole history.

CHAPTER XII

GENERAL CONCLUSIONS

BEFORE our conclusions are presented to the reader we feel that there are some preliminary considerations to which his attention must be directed. In no instance, of which we are aware, has it been possible to trace the physical history of a people through a period of time comparable in length to that which is dealt with in this monograph. While disposed to agree with the most generally accepted dating, which would assign about 6,000 years to the interval between the Early Predynastic age and the Arab invasion, we would point out that even if the reduced estimate of the Berlin School were accepted the range from first to last would still exceed 4,000 years. Such figures when applied to the history of the human race seem startling, and indeed this lapse of time covers the rise and fall of all the great empires of antiquity including that of Rome. But a little reflection will make it apparent that viewed from the standpoint of the succession of generations the opportunities afforded for the production of such changes as might lead to the evolution of distinct types are few in comparison with those which occur in the domain of zoology. Assuming that there are three generations to the century, then in the line of direct descent (supposing such a thing to be possible) the number of individuals through whom the parent strain was transmitted would amount to not more than 180 from first to last. If this be a rather low estimate to apply to a population subjected, as the early inhabitants of Egypt must have been, to particularly inimical influences of war and disease, let it be supposed that there were four generations to the century; and even then the number of transmitters would not be more than 240.

Now in a similar time, assuming that the horse is fit for reproduction at four years of age and that the period of gestation lasts eleven months, there is a possibility of the occurrence of twenty generations of horses in the century, or of 1,200 generations in the 6,000 years with which we are concerned. Calculated on similar lines the dog or cat would have passed through 5,000 generations in a like period, whilst rabbits and mice would have passed through a line of 10,200 and 24,000 ancestors respectively. These figures rather under-estimate than overstate the reproductive potency of the respective stocks.

In view of such facts it is not surprising that the changes which will presently be noted are less striking than the reader might at first be inclined to expect.

Next we must emphasize the fact that the material at our disposal, owing to its amount and to its nature, is superior to any which has hitherto been available. It consists of the measurements of 1,560 skulls, of which over 1,500¹ were obtained from a closely circumscribed geographical area. The cemeteries of Abydos, El Amrah, Shekh Ali, Regagnah, Hou, and Denderah are situated in what was known as the Thebaid or province of Thebes. A reference to the map will show that the distance between the two most widely separated sites, viz. Regagnah and Denderah, is only about 60 miles; Denderah itself being some 40 miles from ancient Thebes, which was the capital of a district extending from Eshmunên in the north to Aswân in the south.

¹ The remaining 54 were obtained from Deshasheh and Medum in Middle Egypt.

C. First Dynasty.

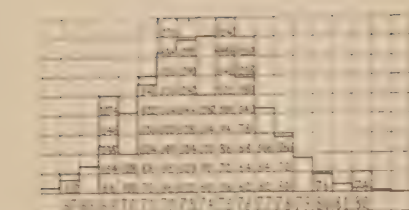


Figure 1. Cephalic Index.
Misfit 35 pc. $M \pm R = 73.50 \pm 2.0$. $\eta = 2.37$. $r = 2.00$.
 $c = 4.23$. $\frac{A}{c\sqrt{\pi}} = 8.18$.
Half the examples are between 71.61 and 75.61.
Total number of specimens, 61.

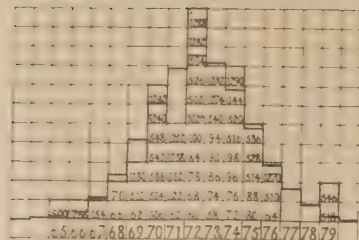


Figure 2. Vertical Index.
Misfit 27 pc. $M \pm R = 72.49 \pm 2.4$. $\eta = 2.10$. $r = 1.76$.
 $c = 3.73$. $\frac{A}{c\sqrt{\pi}} = 8.65$.
Half the examples are between 70.41 and 73.97.
Total number of specimens, 57.

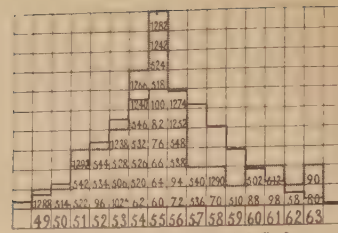


Figure 3. Upper Facial Index.
Misfit 40 pc. $M \pm R = 55.38 \pm 2.9$. $\eta = 2.39$. $r = 2.02$.
 $c = 4.24$. $\frac{A}{c\sqrt{\pi}} = 6.14$.
Half the examples are between 53.36 and 57.40.
Total number of specimens, 47.

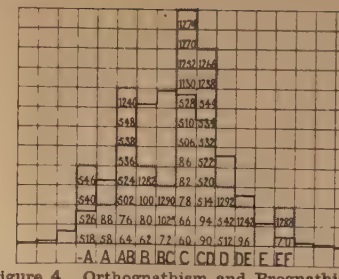


Figure 4. Orthognathism and Prognathism.
Misfit 50 pc. $M \pm R = 53.8 \pm 2.4$. $\eta = 2.00$. $r = 1.69$.
 $c = 3.54$. $\frac{A}{c\sqrt{\pi}} = 7.96$.
Half the examples are between 3.69 and 7.07.
Total number of specimens, 50.

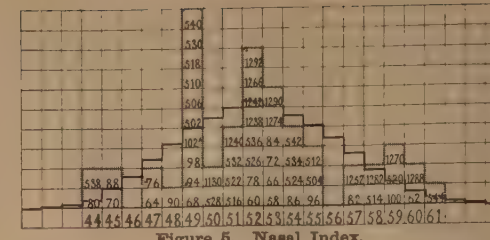


Figure 5. Nasal Index.
Misfit 56 pc. $M \pm R = 52.17 \pm 3.7$. $\eta = 3.23$. $r = 2.73$.
 $c = 5.72$. $\frac{A}{c\sqrt{\pi}} = 5.32$.
Half the examples are between 49.44 and 54.90.
Total number of specimens, 54.

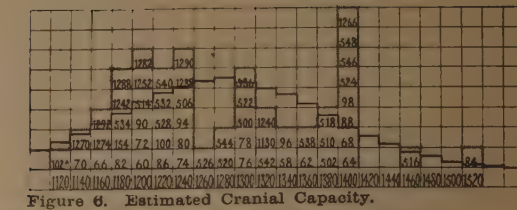


Figure 6. Estimated Cranial Capacity.
Misfit 59 pc. $M \pm R = 1277.2 \pm 9.1$. $\eta = 80.6$. $r = 68.2$.
 $c = 142.9$. $\frac{A}{c\sqrt{\pi}} = 4.42$.
Half the examples are between 1209.0 and 1345.4.
Total number of specimens, 56.

D. Royal Tombs of First and Second Dynasties.

All the series are too small to admit of curves of probability.



Figure 1. Cephalic Index.
 $M = 75.00$.
Total number of specimens, 15.

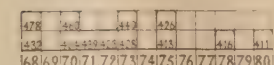


Figure 2. Vertical Index.
 $M = 72.75$.
Total number of specimens, 12.

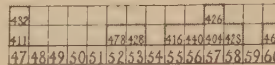


Figure 3. Upper Facial Index.
 $M = 54.20$.
Total number of specimens, 10.

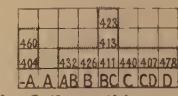


Figure 4. Orthognathism and Prognathism.
 $M = 4.55$.
Total number of specimens, 10.

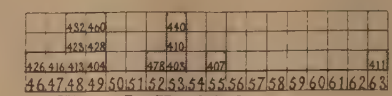


Figure 5. Nasal Index.
 $M = 50.93$.
Total number of specimens, 14.

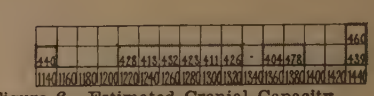


Figure 6. Estimated Cranial Capacity.
 $M = 1307.2$.
Total number of specimens, 11.

F. Sixth to Twelfth Dynasties.

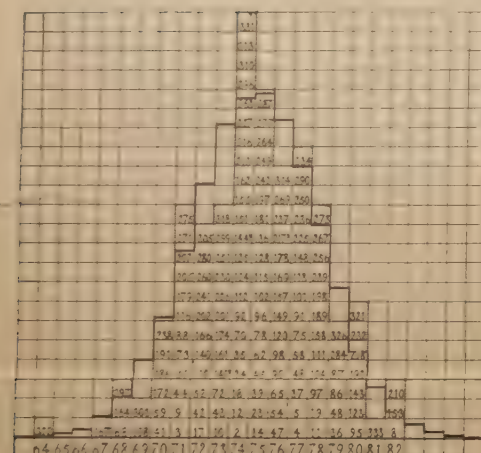


Figure 1. Cephalic Index.
Misfit 21 pc. $M \pm R = 74.71 \pm 1.8$. $\eta = 2.58$. $r = 2.18$.
 $c = 4.58$. $\frac{A}{c\sqrt{\pi}} = 18.00$.
Half the examples are between 72.53 and 76.89.
Total number of specimens, 146.

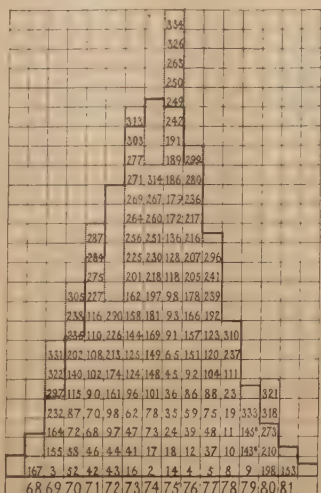


Figure 2. Vertical Index.
Misfit 22 pc. $M \pm R = 74.18 \pm 1.7$. $\eta = 2.38$. $r = 2.01$.
 $c = 4.21$. $\frac{A}{c\sqrt{\pi}} = 19.55$.
Half the examples are between 72.17 and 76.19.
Total number of specimens, 148.

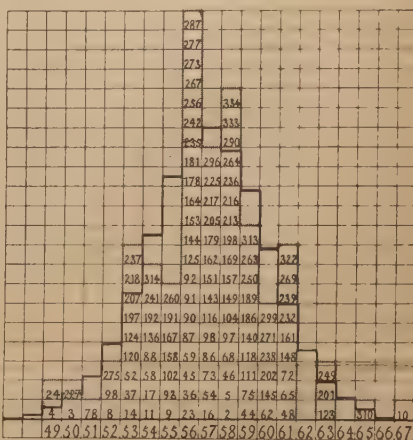


Figure 3. Upper Facial Index.
Misfit 36 pc. $M \pm R = 56.89 \pm 1.9$. $\eta = 2.35$. $r = 1.99$.
 $c = 4.26$. $\frac{A}{c\sqrt{\pi}} = 15.09$.
Half the examples are between 54.90 and 58.88.
Total number of specimens, 114.

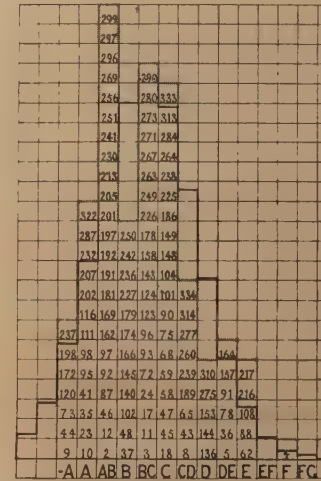


Figure 4. Orthognathism and Prognathism.
Misfit 27 pc. $M \pm R = 4.86 \pm 1.6$. $\eta = 2.07$. $r = 1.75$.
 $c = 3.66$. $\frac{A}{c\sqrt{\pi}} = 18.58$.
Half the examples are between 3.11 and 6.61.
Total number of specimens, 121.

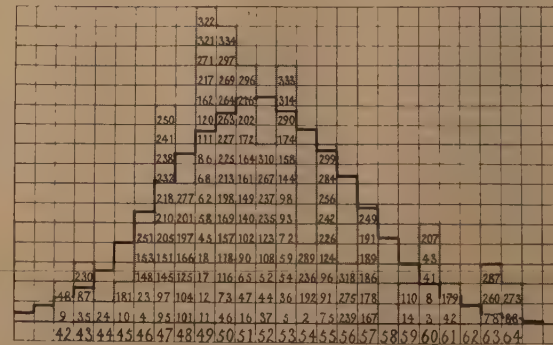


Figure 5. Nasal Index.
Misfit 41 pc. $M \pm R = 51.59 \pm 2.7$. $\eta = 3.65$. $r = 3.08$.
 $c = 6.46$. $\frac{A}{c\sqrt{\pi}} = 11.61$.
Half the examples are between 48.51 and 54.67.
Total number of specimens, 133.

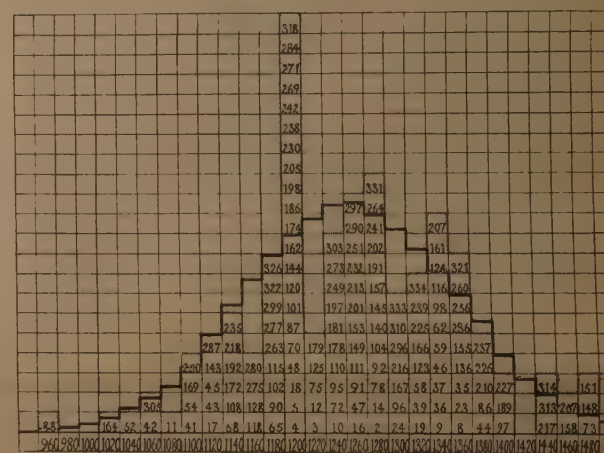


Figure 6. Estimated Cranial Capacity.
Misfit 31 pc. $M \pm R = 1253.8 \pm 5.6$. $\eta = 79.8$. $r = 67.5$.
 $c = 141.5$. $\frac{A}{c\sqrt{\pi}} = 11.64$.
Half the examples are between 1186.3 and 1321.3.
Total number of specimens, 146.

G. Twelfth to Fifteenth Dynasties from Hou.

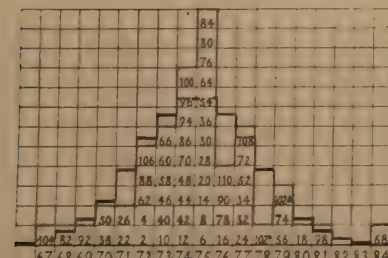


Figure 1. Cephalic Index.
Misfit 35 pc. $M \pm R = 74.50 \pm 2.6$. $\eta = 2.34$. $r = 1.98$.
 $c = 4.15$. $\frac{A}{c\sqrt{\pi}} = 7.62$.
Half the examples are between 72.52 and 76.48.
Total number of specimens, 56.

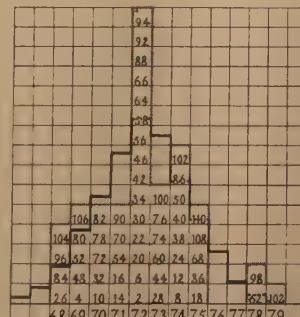


Figure 2. Vertical Index.
Misfit 44 pc. $M \pm R = 72.18 \pm 2.1$. $\eta = 1.86$. $r = 1.57$.
 $c = 3.30$. $\frac{A}{c\sqrt{\pi}} = 9.58$.
Half the examples are between 70.61 and 73.75.
Total number of specimens, 56.

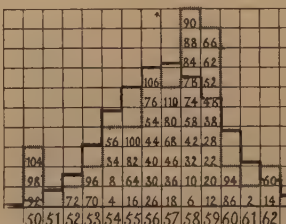


Figure 3. Upper Facial Index.
Misfit 41 pc. $M \pm R = 56.77 \pm 2.6$. $\eta = 2.18$. $r = 1.84$.
 $c = 3.86$. $\frac{A}{c\sqrt{\pi}} = 7.45$.
Half the examples are between 54.91 and 58.59.
Total number of specimens, 51.

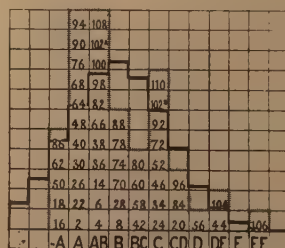


Figure 4. Orthognathism and Prognathism.
Misfit 37 pc. $M \pm R = 3.87 \pm 2.4$. $\eta = 2.09$. $r = 1.77$.
 $c = 3.71$. $\frac{A}{c\sqrt{\pi}} = 8.07$.
Half the examples are between 2.10 and 5.64.
Total number of specimens, 52.

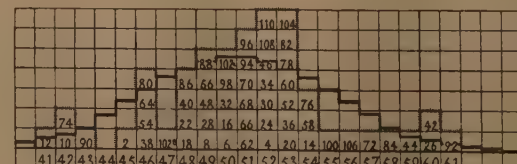


Figure 5. Nasal Index.
Misfit 43 pc. $M \pm R = 50.55 \pm 4.2$. $\eta = 3.71$. $r = 3.14$.
 $c = 6.58$. $\frac{A}{c\sqrt{\pi}} = 4.71$.
Half the examples are between 47.41 and 53.69.
Total number of specimens, 55.

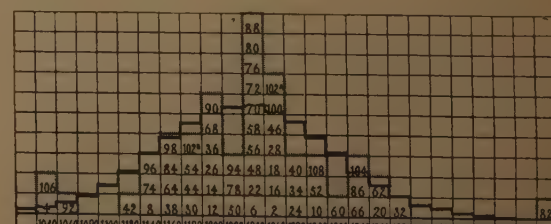


Figure 6. Estimated Cranial Capacity.
Misfit 44 pc. $M \pm R = 1231.6 \pm 7.3$. $\eta = 63.7$. $r = 53.8$.
 $c = 112.8$. $\frac{A}{c\sqrt{\pi}} = 5.50$.
Half the examples are between 1177.8 and 1285.4.
Total number of specimens, 55.

H. Twelfth to Fifteenth Dynasties from Abydos.

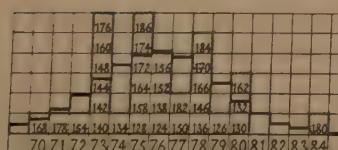


Figure 1. Cephalic Index.
Misfit 60 pc. $M \pm R = 75.81 \pm 3.6$. $\eta = 2.44$. $r = 2.06$.
 $c = 4.32$. $\frac{A}{c\sqrt{\pi}} = 4.18$.
Half the examples are between 73.75 and 77.87.
Total number of specimens, 32.

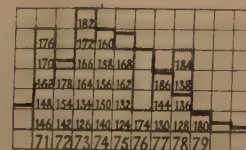


Figure 2. Vertical Index.
Misfit 43 pc. $M \pm R = 74.28 \pm 3.0$. $\eta = 2.02$. $r = 1.71$.
 $c = 3.59$. $\frac{A}{c\sqrt{\pi}} = 5.03$.
Half the examples are between 72.57 and 75.99.
Total number of specimens, 32.

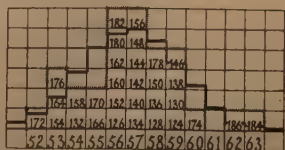


Figure 3. Upper Facial Index.
Misfit 36 pc. $M \pm R = 56.77 \pm 2.9$. $\eta = 1.93$. $r = 1.63$.
 $c = 3.42$. $\frac{A}{c\sqrt{\pi}} = 5.11$.
Half the examples are between 55.14 and 58.40.
Total number of specimens, 31.

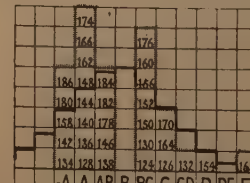


Figure 4. Orthognathism and Prognathism.
Misfit 45 pc. $M \pm R = 3.35 \pm 4.0$. $\eta = 2.22$. $r = 1.88$.
 $c = 3.93$. $\frac{A}{c\sqrt{\pi}} = 4.45$.
Half the examples are between 1.47 and 5.23.
Total number of specimens, 31.

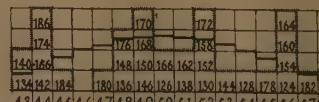


Figure 5. Nasal Index.
Misfit 60 pc. $M \pm R = 50.16 \pm 5.1$. $\eta = 3.67$. $r = 3.10$.
 $c = 6.50$. $\frac{A}{c\sqrt{\pi}} = 2.78$.
Half the examples are between 47.06 and 53.16.
Total number of specimens, 32.



Figure 6. Estimated Cranial Capacity.
Misfit 30 pc. $M \pm R = 1283.2 \pm 10.5$. $\eta = 70.8$. $r = 59.9$.
 $c = 125.5$.
Half the examples are between 1223.3 and 1343.1.
Total number of specimens, 32.

J. Eighteenth Dynasty from Abydos.

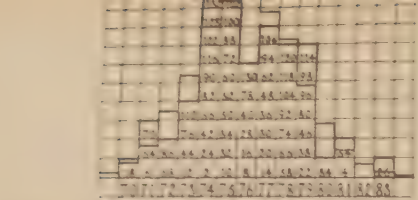


Figure 1. Cephalic Index.
Misfit 34 pc. $M \pm R = 75.82 \pm 2.1$. $\eta = 2.08$. $r = 1.75$.
 $c = 3.66$. $\frac{A}{c\sqrt{\pi}} = 10.75$.
Half the examples are between 74.07 and 77.57.
Total number of specimens, 67.

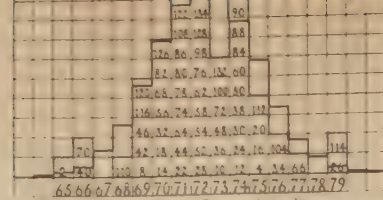


Figure 2. Vertical Index.
Misfit 39 pc. $M \pm R = 72.23 \pm 2.2$. $\eta = 2.11$. $r = 1.79$.
 $c = 3.66$. $\frac{A}{c\sqrt{\pi}} = 9.94$.
Half the examples are between 74.44 and 74.02.
Total number of specimens, 66.

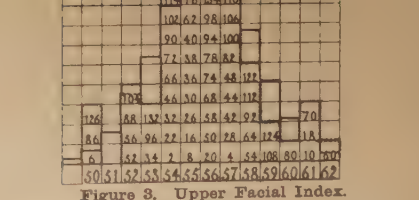


Figure 3. Upper Facial Index.
Misfit 35 pc. $M \pm R = 55.67 \pm 2.1$. $\eta = 1.99$. $r = 1.68$.
 $c = 3.53$. $\frac{A}{c\sqrt{\pi}} = 10.08$.
Half the examples are between 53.99 and 57.35.
Total number of specimens, 63.

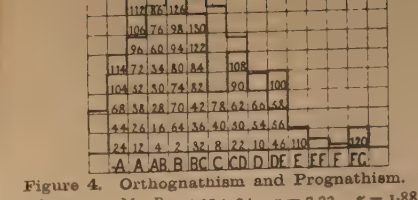


Figure 4. Orthognathism and Prognathism.
Misfit 31 pc. $M \pm R = 4.35 \pm 2.4$. $\eta = 2.22$. $r = 1.88$.
 $c = 3.94$. $\frac{A}{c\sqrt{\pi}} = 8.61$.
Half the examples are between 2.47 and 6.23.
Total number of specimens, 60.

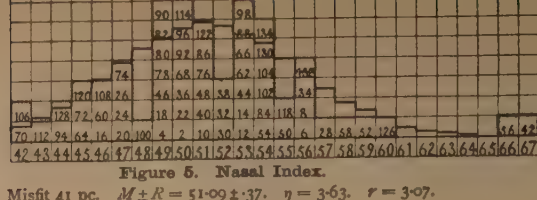


Figure 5. Nasal Index.
Misfit 41 pc. $M \pm R = 51.09 \pm 3.7$. $\eta = 3.63$. $r = 3.07$.
 $c = 6.43$. $\frac{A}{c\sqrt{\pi}} = 5.88$.
Half the examples are between 48.02 and 54.16.
Total number of specimens, 67.

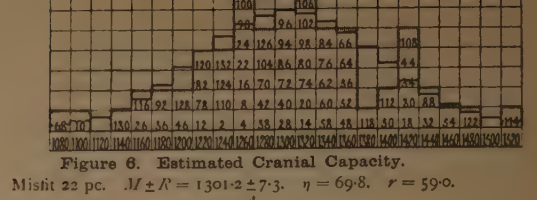


Figure 6. Estimated Cranial Capacity.
Misfit 22 pc. $M \pm R = 1301.2 \pm 7.3$. $\eta = 69.8$. $r = 59.0$.
 $c = 123.8$. $\frac{A}{c\sqrt{\pi}} = 6.03$.
Half the examples are between 1247.2 and 1360.2.
Total number of specimens, 66.

K. Eighteenth Dynasty from Shekh Ali.



Figure 1. Cephalic Index.
Misfit 31 pc. $M \pm R = 74.55 \pm 3.0$. $\eta = 2.93$. $r = 2.42$.
 $c = 5.20$. $\frac{A}{c\sqrt{\pi}} = 5.21$.
Half the examples are between 73.10 and 77.06.
Total number of specimens, 48.

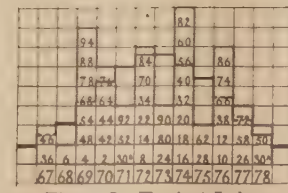


Figure 2. Vertical Index.
Misfit 50 pc. $M \pm R = 72.58 \pm 3.2$. $\eta = 2.58$. $r = 2.18$.
 $c = 4.58$. $\frac{A}{c\sqrt{\pi}} = 5.78$.
Half the examples are between 70.40 and 74.76.
Total number of specimens, 48.

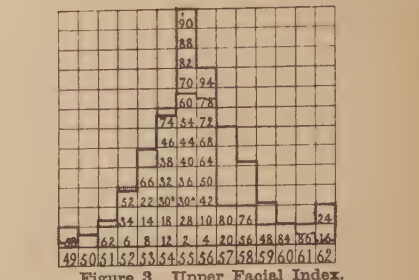


Figure 3. Upper Facial Index.
Misfit 41 pc. $M \pm R = 55.30 \pm 2.3$. $\eta = 1.85$. $r = 1.56$.
 $c = 3.28$. $\frac{A}{c\sqrt{\pi}} = 7.92$.
Half the examples are between 53.74 and 56.86.
Total number of specimens, 46.

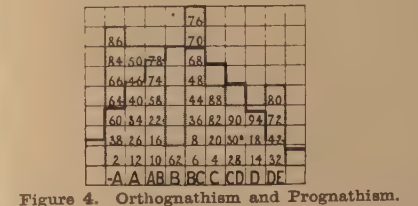


Figure 4. Orthognathism and Prognathism.
Misfit 42 pc. $M \pm R = 4.38 \pm 3.1$. $\eta = 2.38$. $r = 2.01$.
 $c = 4.21$. $\frac{A}{c\sqrt{\pi}} = 5.63$.
Half the examples are between 2.37 and 6.39.
Total number of specimens, 42.

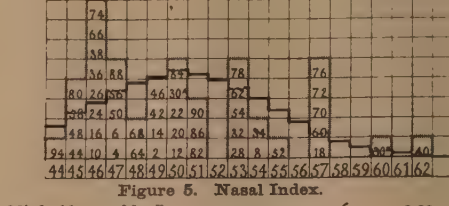


Figure 5. Nasal Index.
Misfit 66 pc. $M \pm R = 50.15 \pm 4.3$. $\eta = 3.46$. $r = 2.92$.
 $c = 6.13$. $\frac{A}{c\sqrt{\pi}} = 4.42$.
Half the examples are between 47.23 and 53.07.
Total number of specimens, 47.

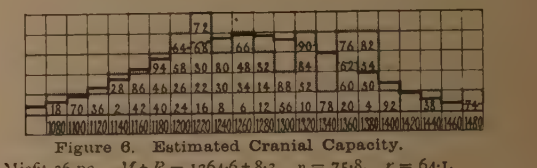


Figure 6. Estimated Cranial Capacity.
Misfit 36 pc. $M \pm R = 1264.6 \pm 8.3$. $\eta = 75.8$. $r = 64.7$.
 $c = 134.4$. $\frac{A}{c\sqrt{\pi}} = 3.95$.
Half the examples are between 1200.5 and 1338.7.
Total number of specimens, 47.

L. Thirtieth Dynasty.

All the series are too small to admit of curves of probability.

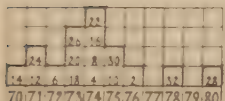


Figure 1. Cephalic Index.
 $M = 73.94$.
Total number of specimens, 16.

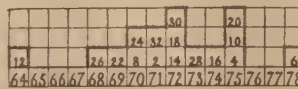


Figure 2. Vertical Index.
 $M = 71.81$.
Total number of specimens, 16.



Figure 3. Upper Facial Index.
 $M = 54.75$.
Total number of specimens, 16.



Figure 4. Orthognathism and Prognathism.
 $M = 3.06$.
Total number of specimens, 14.

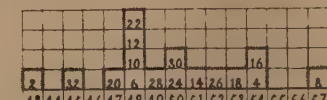


Figure 5. Nasal Index.
 $M = 49.81$.
Total number of specimens, 16.

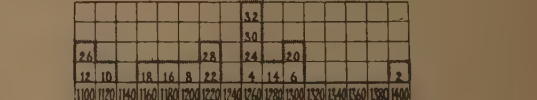


Figure 6. Estimated Cranial Capacity.
 $M = 1246.2$.
Total number of specimens, 16.

M. Ptolemaic Period.

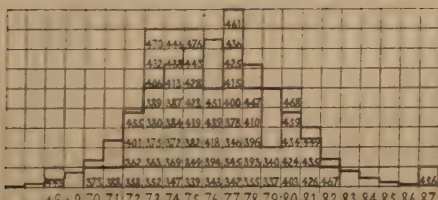


Figure 1. Cephalic Index.
Misfit 37 pc. $M \pm R = 75.97 \pm 2.8$. $\eta = 2.65$. $r = 2.24$.
 $c = 4.69$. $\frac{A}{c\sqrt{\pi}} = 7.46$.
Half the examples are between 73.73 and 78.21.
Total number of specimens, 62.

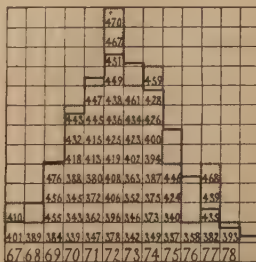


Figure 2. Vertical Index.
Misfit 25 pc. $M \pm R = 72.33 \pm 2.1$. $\eta = 1.97$. $r = 1.67$.
 $c = 3.50$. $\frac{A}{c\sqrt{\pi}} = 9.84$.
Half the examples are between 70.66 and 74.00.
Total number of specimens, 61.

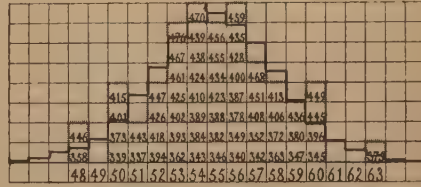


Figure 3. Upper Facial Index.
Misfit 28 pc. $M \pm R = 54.90 \pm 2.7$. $\eta = 2.48$. $r = 2.10$.
 $c = 4.40$. $\frac{A}{c\sqrt{\pi}} = 7.56$.
Half the examples are between 52.80 and 57.00.
Total number of specimens, 59.

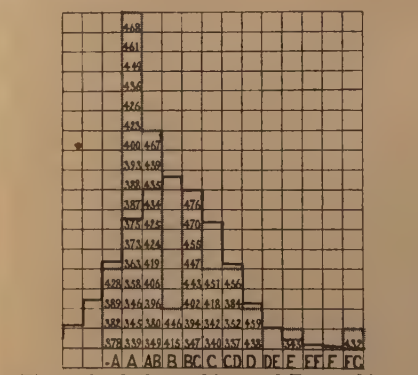


Figure 4. Orthognathism and Prognathism.
Misfit 37 pc. $M \pm R = 3.62 \pm 2.6$. $\eta = 2.28$. $r = 1.93$.
 $c = 4.05$. $\frac{A}{c\sqrt{\pi}} = 7.67$.
Half the examples are between 1.69 and 5.55.
Total number of specimens, 54.

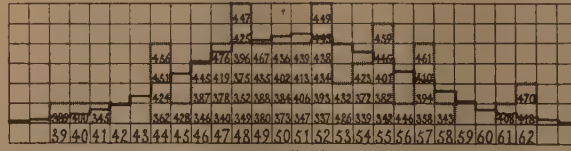


Figure 5. Nasal Index.
Misfit 44 pc. $M \pm R = 50.64 \pm 4.5$. $\eta = 4.05$. $r = 3.44$.
 $c = 7.18$. $\frac{A}{c\sqrt{\pi}} = 4.56$.
Half the examples are between 47.30 and 54.08.
Total number of specimens, 58.

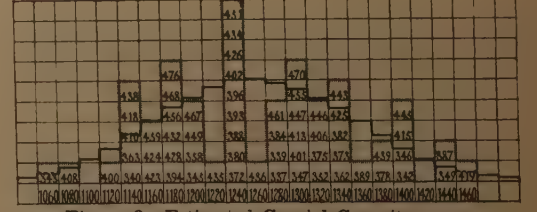


Figure 6. Estimated Cranial Capacity.
Misfit 53 pc. $M \pm R = 1258.4 \pm 8.2$. $\eta = 75.7$. $r = 64.0$.
 $c = 134.2$. $\frac{A}{c\sqrt{\pi}} = 5.13$.
Half the examples are between 1194.4 and 1322.4.
Total number of specimens, 61.

N. Roman Period.

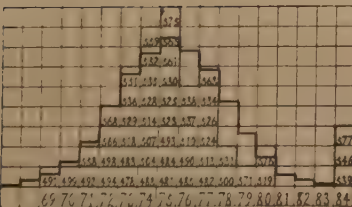


Figure 1. Cephalic Index.
Misfit 29 pc. $M \pm R = 75.08 \pm 2.6$. $\eta = 2.14$. $r = 1.81$.
 $c = 3.79$. $\frac{A}{c\sqrt{\pi}} = 7.44$.
Half the examples are between 73.27 and 76.89.
Total number of specimens, 60.

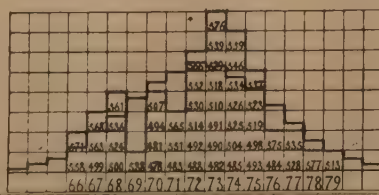


Figure 2. Vertical Index.
Misfit 40 pc. $M \pm R = 72.22 \pm 3.6$. $\eta = 2.95$. $r = 2.49$.
 $c = 5.22$. $\frac{A}{c\sqrt{\pi}} = 5.42$.
Half the examples are between 69.73 and 74.71.
Total number of specimens, 49.

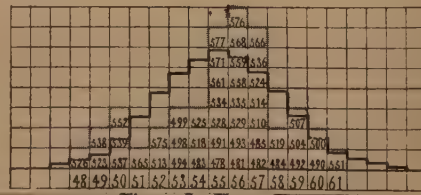


Figure 3. Upper Facial Index.
Misfit 46 pc. $M \pm R = 55.07 \pm 3.0$. $\eta = 2.41$. $r = 2.04$.
 $c = 4.28$. $\frac{A}{c\sqrt{\pi}} = 5.93$.
Half the examples are between 53.03 and 57.11.
Total number of specimens, 45.

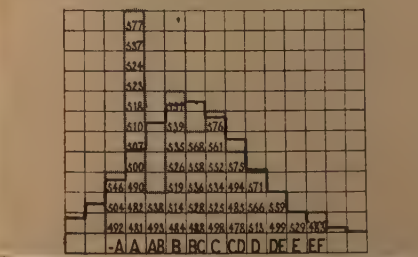


Figure 4. Orthognathism and Prognathism.
Misfit 26 pc. $M \pm R = 4.51 \pm 3.0$. $\eta = 2.34$. $r = 1.98$.
 $c = 4.16$. $\frac{A}{c\sqrt{\pi}} = 6.11$.
Half the examples are between 2.53 and 6.49.
Total number of specimens, 45.

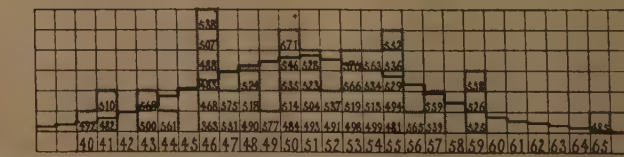


Figure 5. Nasal Index.
Misfit 57 pc. $M \pm R = 50.78 \pm 5.0$. $\eta = 4.20$. $r = 3.51$.
 $c = 7.44$. $\frac{A}{c\sqrt{\pi}} = 3.72$.
Half the examples are between 47.27 and 54.29.
Total number of specimens, 49.

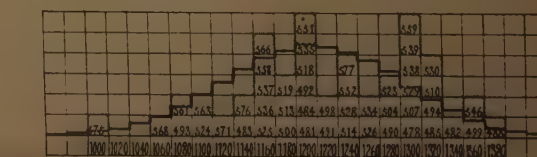


Figure 6. Estimated Cranial Capacity.
Misfit 47 pc. $M \pm R = 1208.0 \pm 8.1$. $\eta = 66.5$. $r = 56.2$.
 $c = 117.9$. $\frac{A}{c\sqrt{\pi}} = 4.59$.
Half the examples are between 1151.8 and 1264.2.
Total number of specimens, 48.

EXPLANATION OF THE DIAGRAMS.—The larger figures at the base in each diagram denote the index-values. The numerals in the squares above these are not mathematical values, but are the catalogue-numbers of the individual specimens which compose the series. Each specimen occupies a single square; the outline formed by these squares is shown by a cross-hatching round them. The hatched line accordingly depicts the "frequency curve"; that is to say, it registers the actual frequency of the occurrence of the various index-values.

The solid line, on the other hand, represents the "probability curve"; that is to say, the outline to which the series, supposing it to be pure, would conform if it agreed with the theory of the Law of Errors. A comparison of the hatched line with the solid line shows the extent to which the series fails to agree with that law; and the amount of such misfit is given among the calculations below the diagram.

The meaning of the mathematical symbols is as follows:—

M is the arithmetical mean of the series.

R is the amount of oscillation of the arithmetical mean.

η is the "average error," i.e. the arithmetical average of the deviations from the arithmetical mean.

r is the "probable error," or "oscillation-index" of the series.

c is the modulus of the curve, and determines the shape of the "probability curve" in conjunction with

$\frac{A}{c\sqrt{\pi}}$, which is the number of specimens which ought to occur at the arithmetical mean on the theory of the Law of Errors.

For further explanations and details of the theory see the chapter on Mathematical Treatment in the text of the volume.

ANCIENT EGYPTIAN SKULLS ARRANGED ACCORDING TO PERIODS.

Diagrams exhibiting the actual frequency and the theoretical probability of the occurrence of the various grades in six characteristic features (with the catalogue-number of each individual specimen for purposes of correlation between the several tables of any one period).

CHART II. FEMALES.

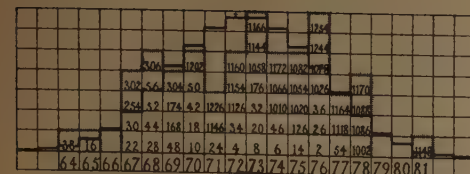


Figure 1. Cephalic Index.

Misfit 36 pc. $M \pm R = 72.49 \pm 3.1$. $\eta = 2.84$. $r = 2.40$.

$$c = 5.04. \quad \frac{A}{c\sqrt{\pi}} = 6.82.$$

Half the examples are between 70.09 and 74.89.
Total number of specimens, 60.

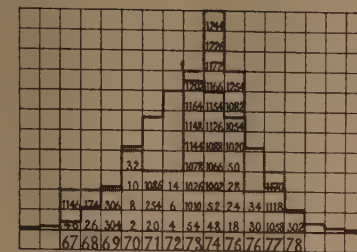


Figure 2. Vertical Index.

Misfit 42 pc. $M \pm R = 72.98 \pm 3.5$. $\eta = 2.07$. $r = 1.75$.

$$c = 3.67. \quad \frac{A}{c\sqrt{\pi}} = 7.54.$$

Half the examples are between 71.23 and 74.73.
Total number of specimens, 49.

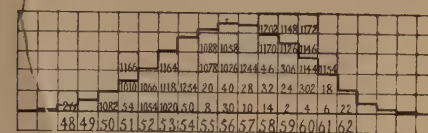


Figure 3. Upper Facial Index.

Misfit 56 pc. $M \pm R = 56.36 \pm 3.8$. $\eta = 2.91$. $r = 2.46$.

$$c = 5.16. \quad \frac{A}{c\sqrt{\pi}} = 4.59.$$

Half the examples are between 53.90 and 58.82.
Total number of specimens, 42.

A. Early Predynastic.

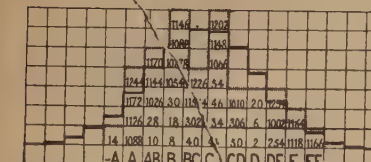


Figure 4. Orthognathism and Prognathism.

Misfit 30 pc. $M \pm R = 5.37 \pm 2.9$. $\eta = 2.14$. $r = 1.81$.

$$c = 3.80. \quad \frac{A}{c\sqrt{\pi}} = 5.94.$$

Half the examples are between 3.56 and 7.18.
Total number of specimens, 40.

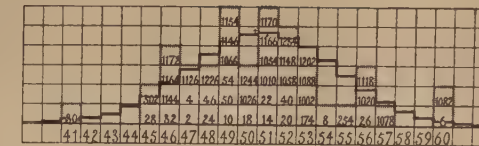


Figure 5. Nasal Index.

Misfit 43 pc. $M \pm R = 50.80 \pm 3.8$. $\eta = 3.05$. $r = 2.58$.

$$c = 5.40. \quad \frac{A}{c\sqrt{\pi}} = 4.70.$$

Half the examples are between 48.22 and 53.38.
Total number of specimens, 45.

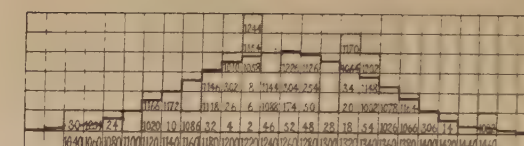


Figure 6. Estimated Cranial Capacity.

Misfit 34 pc. $M \pm R = 1253.4 \pm 9.1$. $\eta = 75.2$. $r = 63.6$.

$$c = 133.3. \quad \frac{A}{c\sqrt{\pi}} = 4.14.$$

Half the examples are between 1189.8 and 1317.0.
Total number of specimens, 49.

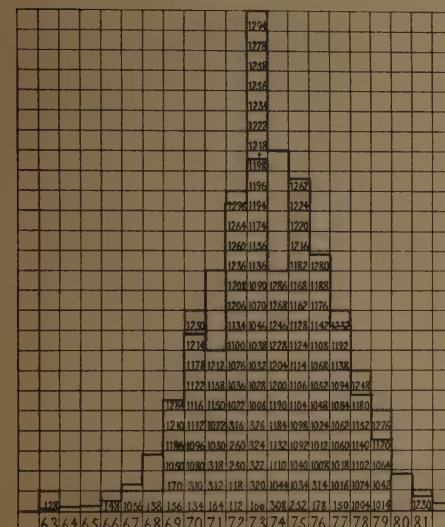


Figure 1. Cephalic Index.

Misfit 23 pc. $M \pm R = 73.63 \pm 1.5$. $\eta = 2.35$. $r = 1.98$.

$$c = 4.16. \quad \frac{A}{c\sqrt{\pi}} = 18.17.$$

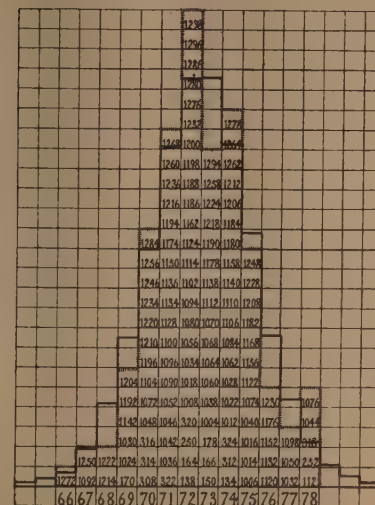


Figure 2. Vertical Index.

Misfit 20 pc. $M \pm R = 72.55 \pm 1.4$. $\eta = 1.93$. $r = 1.63$.

$$c = 3.42. \quad \frac{A}{c\sqrt{\pi}} = 20.97.$$

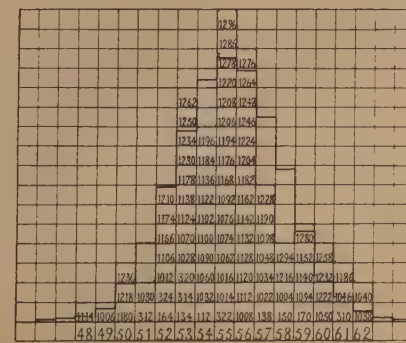


Figure 3. Upper Facial Index.

Misfit 28 pc. $M \pm R = 55.13 \pm 1.9$. $\eta = 2.14$. $r = 1.81$.

$$c = 3.79. \quad \frac{A}{c\sqrt{\pi}} = 13.56.$$

B. Late Predynastic.

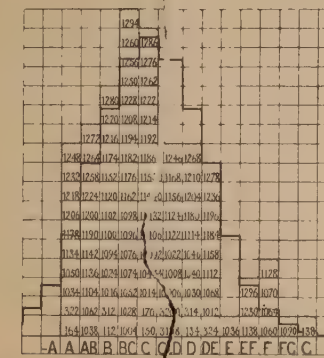


Figure 4. Orthognathism and Prognathism.

Misfit 22 pc. $M \pm R = 5.91 \pm 1.8$. $\eta = 2.26$. $r = 1.90$.

$$c = 4.00. \quad \frac{A}{c\sqrt{\pi}} = 14.95.$$

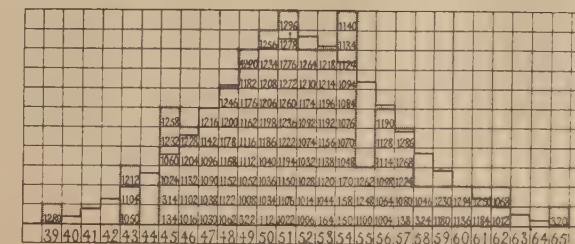


Figure 5. Nasal Index.

Misfit 24 pc. $M \pm R = 51.57 \pm 2.9$. $\eta = 3.65$. $r = 3.08$.

$$c = 6.46. \quad \frac{A}{c\sqrt{\pi}} = 9.78.$$

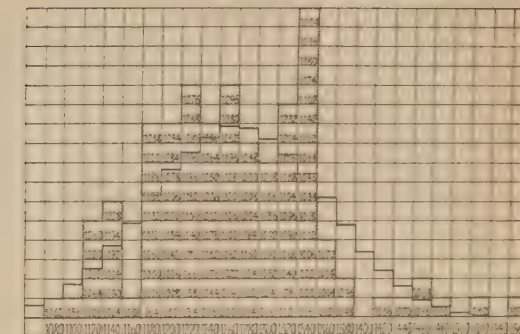


Figure 6. Estimated Cranial Capacity.

Misfit 37 pc. $M \pm R = 1268.8 \pm 5.7$. $\eta = 72.0$. $r = 60.8$.

$$c = 127.4. \quad \frac{A}{c\sqrt{\pi}} = 10.09.$$

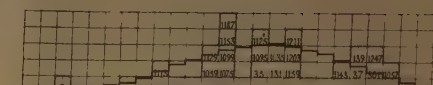
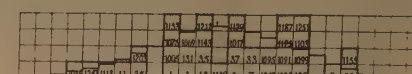
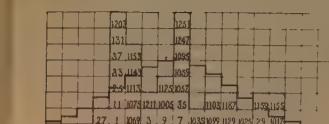
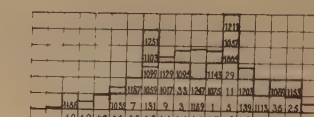
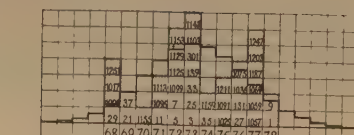
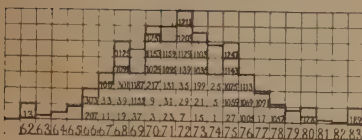
A

24 25 26 27 28

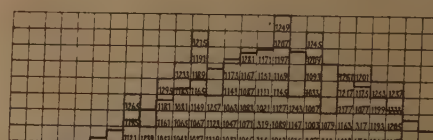
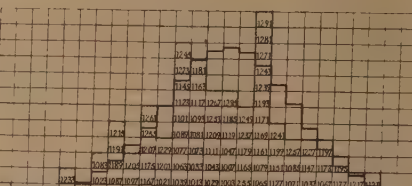
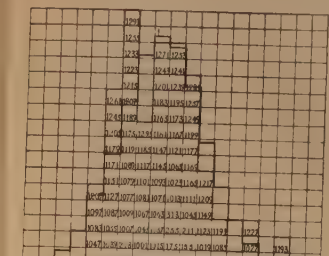
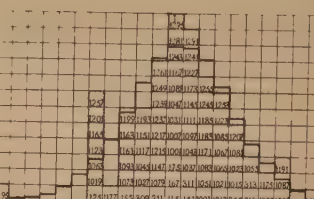
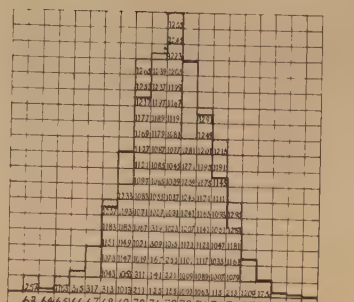
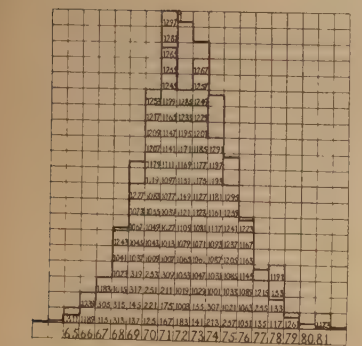
Diagrams exhibiting the actual frequency and the theoretical probability of the occurrence of the various grades in six characteristic features (with the catalogue-number of each individual specimen for purposes of correlation between the several tables of any one period).

CHART I. MALES.

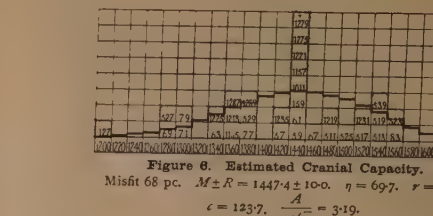
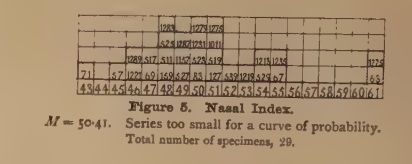
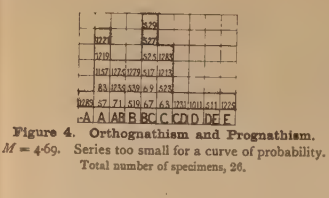
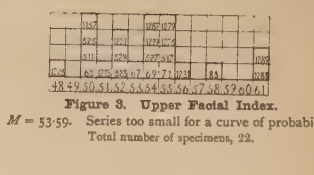
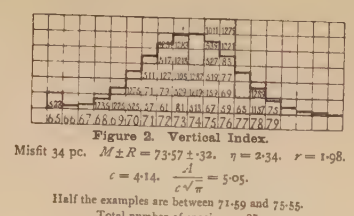
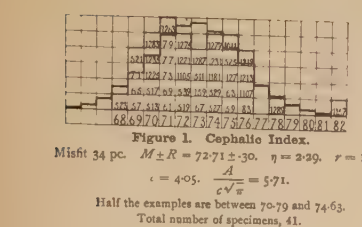
A. Early Predynastic.



B. Late Predynastic.

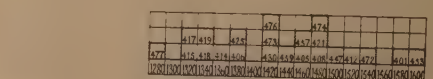
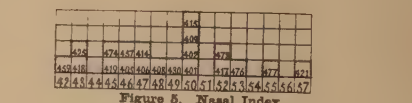
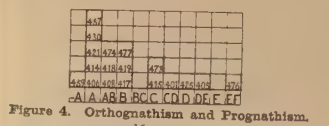
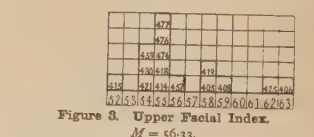
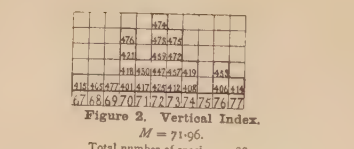
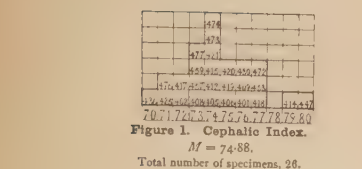


C. First Dynasty.

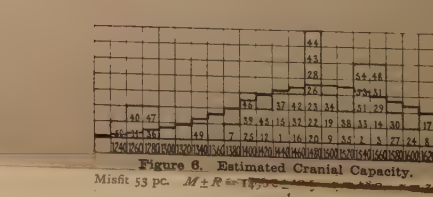
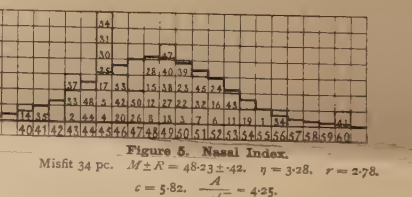
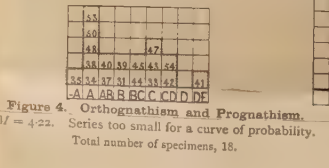
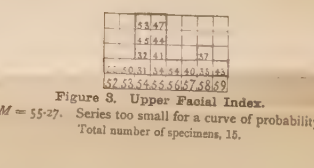
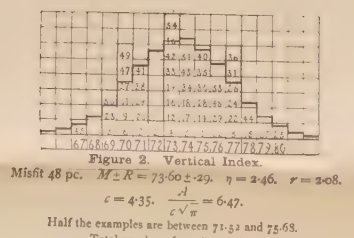
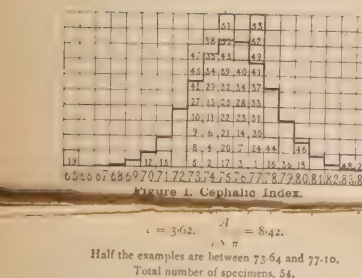


D. Royal Tombs of First and Second Dynasties.

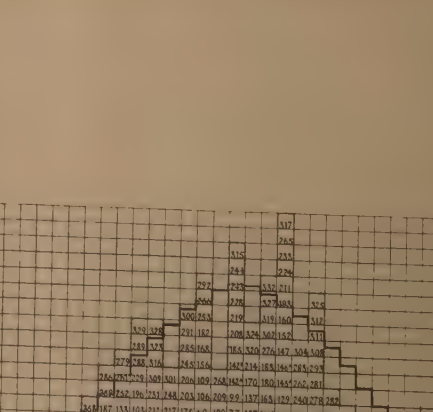
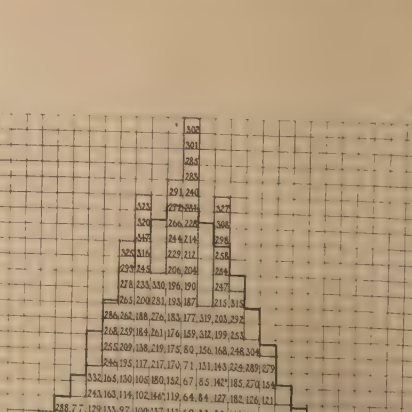
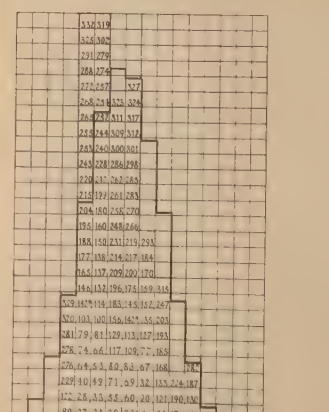
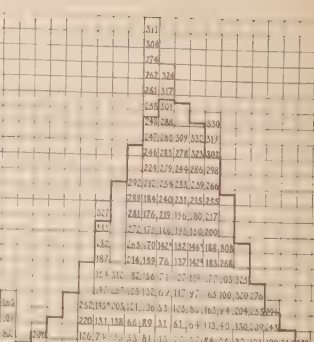
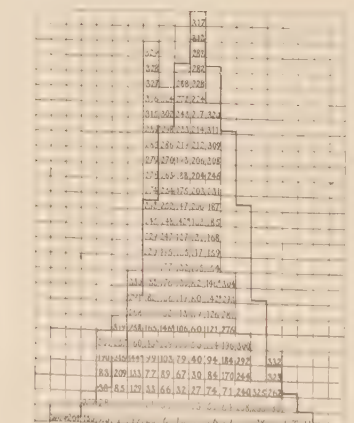
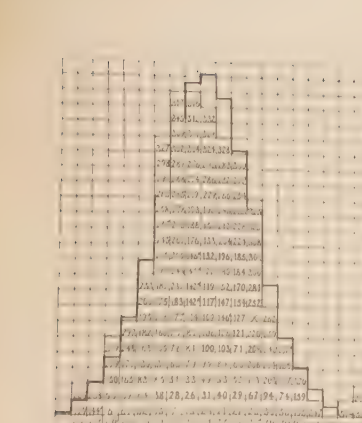
All the series are too small to admit of curves of probability.



E. Fourth and Fifth Dynasties.



F. Sixth to Twelfth Dynasties.



G. Twelfth to Fifteenth Dynasties from Hou.

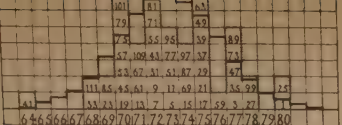


Figure 1. Cephalic Index.
Misfit 53 pc. $M \pm R = 72.94 \pm 2.8$. $\eta = 2.49$. $r = 2.10$.
 $c = 4.41$. $\frac{A}{c\sqrt{\pi}} = 7.03$.
Half the examples are between 70.84 and 75.04.
Total number of specimens, 55.

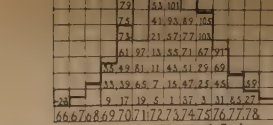


Figure 2. Vertical Index.
Misfit 29 pc. $M \pm R = 72.71 \pm 2.2$. $\eta = 1.92$. $r = 1.62$.
 $c = 3.40$. $\frac{A}{c\sqrt{\pi}} = 8.96$.
Half the examples are between 71.09 and 74.33.
Total number of specimens, 54.

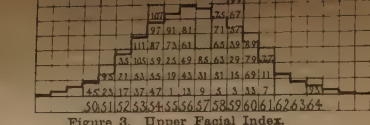


Figure 3. Upper Facial Index.
Misfit 31 pc. $M \pm R = 56.36 \pm 3.2$. $\eta = 2.65$. $r = 2.24$.
 $c = 4.70$. $\frac{A}{c\sqrt{\pi}} = 6.00$.
Half the examples are between 54.12 and 58.60.
Total number of specimens, 50.

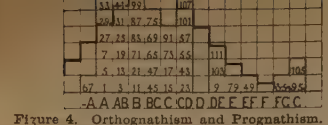


Figure 4. Orthognathism and Prognathism.
Misfit 41 pc. $M \pm R = 49.44 \pm 4.7$. $\eta = 4.15$. $r = 3.51$.
 $c = 5.07$. $\frac{A}{c\sqrt{\pi}} = 5.88$.
Half the examples are between 2.11 and 6.95.
Total number of specimens, 63.

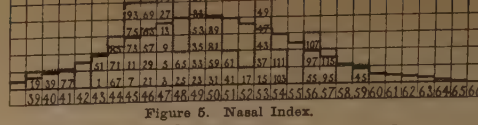


Figure 5. Nasal Index.
Misfit 56 pc. $M \pm R = 49.44 \pm 4.7$. $\eta = 4.15$. $r = 3.51$.
 $c = 7.36$. $\frac{A}{c\sqrt{\pi}} = 4.22$.
Half the examples are between 48.93 and 52.95.
Total number of specimens, 56 (if no. 105 with index 71 be included).

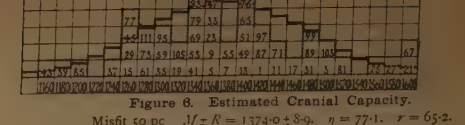


Figure 6. Estimated Cranial Capacity.
Misfit 50 pc. $M \pm R = 1374.0 \pm 8.9$. $\eta = 77.1$. $r = 65.2$.
 $c = 136.7$. $\frac{A}{c\sqrt{\pi}} = 4.47$.
Half the examples are between 1358.8 and 1439.2.
Total number of specimens, 54.

H. Twelfth to Fifteenth Dynasties from Abydos.

All the series are too small to admit of curves of probability.

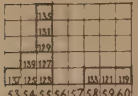


Figure 3. Upper Facial Index.
Misfit 31 pc. $M \pm R = 55.18$.
Total number of specimens, 11.

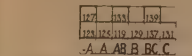


Figure 4. Orthognathism and Prognathism.
Misfit 41 pc. $M \pm R = 3.35$.
Total number of specimens, 9.

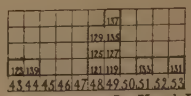


Figure 5. Nasal Index.
Misfit 56 pc. $M \pm R = 4.27$.
Total number of specimens, 11.

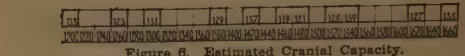


Figure 6. Estimated Cranial Capacity.
Misfit 50 pc. $M \pm R = 1440$.
Total number of specimens, 11.

J. Eighteenth Dynasty from Abydos.

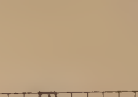


Figure 3. Upper Facial Index.
Misfit 20 pc. $M \pm R = 55.55 \pm 2.3$. $\eta = 1.87$. $r = 1.58$.
 $c = 3.31$. $\frac{A}{c\sqrt{\pi}} = 8.34$.
Half the examples are between 54.01 and 57.17.
Total number of specimens, 49.

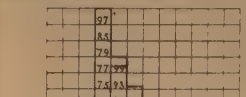


Figure 4. Orthognathism and Prognathism.
Misfit 30 pc. $M \pm R = 3.02 \pm 1.9$. $\eta = 1.50$. $r = 1.27$.
 $c = 2.65$. $\frac{A}{c\sqrt{\pi}} = 9.57$.
Half the examples are between 1.75 and 4.29.
Total number of specimens, 45.



Figure 5. Nasal Index.
Misfit 45 pc. $M \pm R = 48.82 \pm 3.8$. $\eta = 3.16$. $r = 2.67$.
 $c = 5.61$. $\frac{A}{c\sqrt{\pi}} = 5.03$.
Half the examples are between 46.15 and 51.49.
Total number of specimens, 50.



Figure 6. Estimated Cranial Capacity.
Misfit 55 pc. $M \pm R = 1455.6 \pm 11.1$. $\eta = 92.6$. $r = 78.3$.
 $c = 164.2$. $\frac{A}{c\sqrt{\pi}} = 3.44$.
Half the examples are between 1377.3 and 1533.9.
Total number of specimens, 50.

K. Eighteenth Dynasty from Shekh Ali.

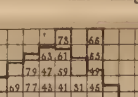


Figure 3. Upper Facial Index.
Misfit 35 pc. $M \pm R = 55.26 \pm 3.4$. $\eta = 2.47$. $r = 2.09$.
 $c = 4.39$. $\frac{A}{c\sqrt{\pi}} = 4.89$.
Half the examples are between 53.17 and 57.35.
Total number of specimens, 37.



Figure 4. Orthognathism and Prognathism.
Misfit 33 pc. $M \pm R = 4.42 \pm 3.0$. $\eta = 2.20$. $r = 1.86$.
 $c = 3.90$. $\frac{A}{c\sqrt{\pi}} = 5.59$.
Half the examples are between 2.56 and 6.28.
Total number of specimens, 38.

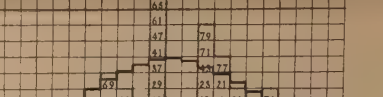


Figure 5. Nasal Index.
Misfit 67 pc. $M \pm R = 47.87 \pm 4.3$. $\eta = 3.15$. $r = 2.66$.
 $c = 5.59$. $\frac{A}{c\sqrt{\pi}} = 3.94$.
Half the examples are between 45.21 and 50.53.
Total number of specimens, 89.

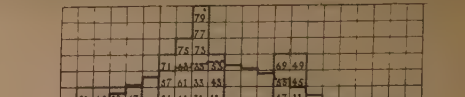


Figure 6. Estimated Cranial Capacity.
Misfit 71 pc. $M \pm R = 1374.2 \pm 9.7$. $\eta = 73.2$. $r = 61.8$.
 $c = 129.7$. $\frac{A}{c\sqrt{\pi}} = 3.57$.
Half the examples are between 1312.4 and 1436.0.
Total number of specimens, 41.

L. Thirtieth Dynasty.

All the series are too small to admit of curves of probability.

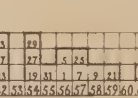


Figure 3. Upper Facial Index.
Misfit 23 pc. $M \pm R = 71.71 \pm 2.1$. $\eta = 2.16$. $r = 1.82$.
 $c = 3.82$. $\frac{A}{c\sqrt{\pi}} = 11.07$.
Half the examples are between 69.89 and 73.53.
Total number of specimens, 75.

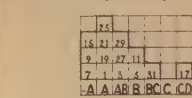


Figure 4. Orthognathism and Prognathism.
Misfit 50 pc. $M \pm R = 3.17 \pm 2.3$. $\eta = 2.24$. $r = 1.89$.
 $c = 3.96$. $\frac{A}{c\sqrt{\pi}} = 9.82$.
Half the examples are between 1.08 and 5.06.
Total number of specimens, 69.

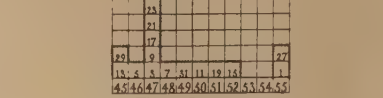


Figure 5. Nasal Index.
Misfit 43 pc. $M \pm R = 49.56 \pm 2.6$. $\eta = 2.73$. $r = 2.31$.
 $c = 4.85$. $\frac{A}{c\sqrt{\pi}} = 8.96$.
Half the examples are between 47.25 and 51.87.
Total number of specimens, 77.

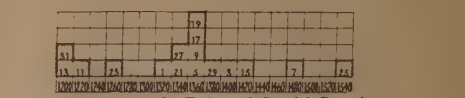


Figure 6. Estimated Cranial Capacity.
Misfit 39 pc. $M \pm R = 1386.2 \pm 6.9$. $\eta = 70.6$. $r = 59.9$.
 $c = 125.1$. $\frac{A}{c\sqrt{\pi}} = 6.67$.
Half the examples are between 1326.3 and 1446.1.
Total number of specimens, 74.

M. Ptolemaic Period.



Figure 3. Upper Facial Index.
Misfit 31 pc. $M \pm R = 55.14 \pm 2.4$. $\eta = 2.46$. $r = 2.08$.
 $c = 4.38$. $\frac{A}{c\sqrt{\pi}} = 9.58$.
Half the examples are between 53.06 and 57.22.
Total number of specimens, 73.

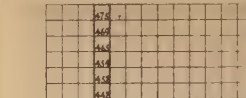


Figure 4. Orthognathism and Prognathism.
Misfit 50 pc. $M \pm R = 3.17 \pm 2.3$. $\eta = 2.24$. $r = 1.89$.
 $c = 3.96$. $\frac{A}{c\sqrt{\pi}} = 9.82$.
Half the examples are between 1.08 and 5.06.
Total number of specimens, 69.



Figure 5. Nasal Index.
Misfit 43 pc. $M \pm R = 49.56 \pm 2.6$. $\eta = 2.73$. $r = 2.31$.
 $c = 4.85$. $\frac{A}{c\sqrt{\pi}} = 8.96$.
Half the examples are between 47.25 and 51.87.
Total number of specimens, 77.

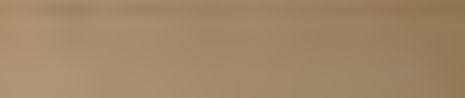


Figure 6. Estimated Cranial Capacity.
Misfit 39 pc. $M \pm R = 1386.2 \pm 6.9$. $\eta = 70.6$. $r = 59.9$.
 $c = 125.1$. $\frac{A}{c\sqrt{\pi}} = 6.67$.
Half the examples are between 1326.3 and 1446.1.
Total number of specimens, 74.

N. Roman Period.



Figure 3. Upper Facial Index.
Misfit 38 pc. $M \pm R = 55.75 \pm 3.9$. $\eta = 3.08$. $r = 2.61$.
 $c = 5.47$. $\frac{A}{c\sqrt{\pi}} = 4.65$.
Half the examples are between 53.14 and 58.36.
Total number of specimens, 45.

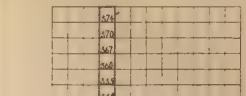


Figure 4. Orthognathism and Prognathism.
Misfit 30 pc. $M \pm R = 2.98 \pm 2.4$. $\eta = 1.89$. $r = 1.60$.
 $c = 3.35$. $\frac{A}{c\sqrt{\pi}} = 7.74$.
Half the examples are between 1.38 and 4.58.
Total number of specimens, 48.



Figure 5. Nasal Index.
Misfit 50 pc. $M \pm R = 49.11 \pm 4.3$. $\eta = 3.38$. $r = 2.86$.
 $c = 5.99$. $\frac{A}{c\sqrt{\pi}} = 4.33$.
Half the examples are between 46.25 and 51.97.
Total number of specimens, 46.



Figure 6. Estimated Cranial Capacity.
Misfit 54 pc. $M \pm R = 1375.2 \pm 9.4$. $\eta = 77.4$. $r = 65.4$.
 $c = 137.2$. $\frac{A}{c\sqrt{\pi}} = 4.03$.
Half the examples are between 1309.8 and 1440.6.
Total number of specimens, 50.

EXPLANATION OF THE DIAGRAMS. The larger figures at the base in each diagram denote the index-values. The numerals in the squares above these are not mathematical values, but are the catalogue-numbers of the individual specimens which compose the series. Each specimen occupies a single square; the outline formed by these squares is shown by a cross-hatching round them. The hatched line accordingly depicts the "frequency curve"; that is to say, it registers the actual frequency of the occurrence of the various index-values.

The solid line, on the other hand, represents the "probability curve"; that is to say, the outline to which the series, supposing it to be pure, would conform if it agreed with the theory of the Law of Errors. A comparison of the hatched line with the solid line shows the extent to which the series fails to agree with that law; and the amount of such misfit is given among the calculations below the diagram.

The meaning of the mathematical symbols is as follows:—

M is the arithmetical mean of the series.

R is the amount of oscillation of the series.

η is the "average error," i.e. the arithmetical average of the deviations from the arithmetical mean.

r is the "probable error," i.e. the "oscillation-index" of the series.

c is the modulus of the curve, and determines the shape of the "probability curve" in conjunction with

$\frac{A}{c\sqrt{\pi}}$, which is the number of specimens which ought to occur at the arithmetical mean on the theory of the Law of Errors.

For further explanations and details of the theory see the chapter on Mathematical Treatment in the text of the volume.

Moreover, not only are these specimens selected from a restricted area but they acquire additional value from having been obtained in the course of excavations carried out by trained archaeologists, who have recorded their results in a series of exhaustive scientific monographs¹.

Consequently it has been possible to allot the material to well-marked chronological periods in accordance with the archaeological evidence; and the accuracy of the observations is vouched for by one of the authors, who was present at, and took part in, the actual explorations.

A reference to the list published in the Appendix will show that the several periods are unequally represented. In some the number of specimens is sufficiently large to justify a considerable degree of confidence in the deductions which are drawn, in others the series are smaller. If it be objected that the utilization of the latter is unjustifiable, we would point out that we have been guarded in drawing definite conclusions from what we consider inadequate data, though we have not hesitated to use the small series as corroborative evidence. It would have been easy to have adapted the material to the requirements of those who claim to treat these problems statistically, by neglecting the labours of archaeologist and historian and combining the twelve or fourteen distinct series into a hotchpotch under the title of 'Ancient Egyptians.' It would have been possible also to have further amplified such a collection by the inclusion of numerous other crania of uncertain date. To do this, however, would have been to sacrifice the peculiar objects of our investigation; since it has been our first aim to furnish an independent record, which, in so far as it succeeds in being a physical history, may supplement the documentary and monumental records, or in some cases even replace them when they are defective.

From these considerations it will be apparent why no reference has been made to the work of the numerous authors who have already written upon the origins or racial affinities of the 'Ancient Egyptians.' The question has been treated on first-hand evidence by such anthropologists as Blumenbach, Cuvier, Gliddon, Morton, Nott, Prichard, and Pruner Bey, and in more recent times by C. Fawcett, Fouquet, Hartmann, Schmidt, Sergi, Virchow, and Warren. But though their material was sometimes considerable yet it was either less representative or less accurately dated than that which we are here enabled to present.

In summarizing the results of the present inquiry the fact should not be overlooked that this physical history is restricted to the Theban province of Upper Egypt. What may have been the conditions in Lower Egypt we do not profess to say. It will prove extremely interesting to see whether there is any appreciable difference in the composition of the population in districts further north. Therefore it is to be hoped that in excavations which may be undertaken in Lower Egypt, and elsewhere, the cranial and skeletal remains will receive no less attention than the objects of purely archaeological interest. It is most satisfactory to observe that care has been taken to study and preserve the specimens discovered during the recent excavations in Crete. Had a like interest been shown by the explorers in Mesopotamia it might have been possible to decide definitely how far the theory of those who believe in a racial connexion between Egypt and Babylonia is justified.

¹ Published mainly under the auspices of the Egypt Exploration Fund (see bibliographical references in the Appendix).

The first point of importance which seems to us to be fully established is the stability of the racial elements which are found. These seem to have been little influenced by invasion and immigration, and preserve their identity in a remarkable degree in spite of the fact that there must have been frequent crossing. It may be that the parent stocks were reinforced from time to time by fresh accessions; and there is a certain amount of evidence that this happened in some instances, though the facts before us do not allow us to assume that these additions have had much permanent influence on the predominant stocks. For we are bound to recognize the remarkable circumstance that the racial elements just before the commencement of mediæval history are practically the same that they were in the earliest Chalcolithic age.

The evidence which has been adduced demonstrates conclusively that the ancient population of Upper Egypt was not composed of a single race-stock, but even in the earliest days was made up of diverse elements. This we regard as one of the most substantial results of our inquiry, since it disposes at once of the long-continued dispute as to the 'Caucasian' or the 'African' origin of 'the Egyptian race.' It is unnecessary to go more minutely into the arguments on which this opinion is based since they have been fully elaborated in the text of the preceding pages. But the reader may be reminded that whilst we were unable to classify the skulls according to *cranial* form, the appearance of the *facial* skeleton was such as to enable us to recognize two distinct groups, viz. one with characteristics which are universally admitted to be negroid, and the other with characteristics which, whatever they may be, are certainly non-negroid.

The reader may not only satisfy himself of the truth of these assertions by reference to the measurements and the schematic diagrams, but may have ocular demonstration if he examines the plates of photographs, which, be it noted, have not been specially selected, but include virtually all the skulls which were available for graphic representation. (Plates VI and VII.)

As regards the negroid element, the immediate proximity of Nubia to the geographical area under consideration naturally suggests an influence from that quarter. The boundaries of Egypt were early extended as far south as the first cataract, and campaigns against the negroes are constantly mentioned in chronicles of every date. With the non-negroid stock, however, the problem is more difficult. There are at least five directions from which it might originally have entered the country, viz. North-West Africa, the sea-coast of the Delta, the Sinaitic peninsula, the Red Sea at Kosseir, and Abyssinia. That is to say that *prima facie* it might have been affiliated to the Berber-Libyan, to some other Mediterranean, or to a Semitic stock, supposing that it did not originate from yet another source as yet wholly undetermined. The question is one on which no definite pronouncement can yet be made, since the physical characteristics of these races in ancient times have not yet been satisfactorily determined. We must be content to have succeeded in isolating this ethnic factor and must leave its precise identification as a subject for future research¹.

A natural but unjustifiable prejudice inclines the theorist to suppose that black men, who in modern days have generally belonged to slave or subject populations, must

¹ As bearing on a controversy which is not yet extinct, it may be pointed out that the conclusions here arrived at are quite destructive of the Libyo-Egyptian theory in the form in which it was put forward by the authors of *Nagada and Ballas*. The foundation of the theory was the idea that the archaic population differed from that of later times. We have found that on the contrary the component factors were the same from first to last, and that the negroid, which is certainly a non-Libyan element, is represented in its strongest form in the earliest periods.

necessarily have always held that position. But this was not the case in the most ancient times in Egypt; for during the Predynastic periods at any rate the negroids, judging from the character of their graves, were the social equals of the others. It is possible that the non-negroids gained the upper hand in later times, and perhaps it may be significant that the negroid factor is almost unrepresented amongst the males of the Royal Tombs of the first two Dynasties. But it forms a sixth part of the high-class population buried at Abydos in the Eighteenth Dynasty, so that evidently the negroid men held their own with the aristocracy of that time; and again the relative proportions of negroid and non-negroid are almost the same in the low-class population of Shekh Ali as among the nobility and wealthy folk of Abydos.

Both races underwent certain modifications at various times. Some of these modifications are progressive and may accordingly be regarded as evolutionary changes. Thus the negroid element in spite of occasional reinforcements, while it retained the characteristic broad nose and broad face, had lost by Roman times a great deal of that prognathism which is so marked a characteristic of the pure-blooded negro and which was very noticeable in the earliest periods. The only other great progressive change is confined to the female population and is concerned with a reduction of stature. From the paucity of the material available it is difficult to decide whether the reduction was more marked in one race-stock than in the other; but the fact is unquestionable that the femoral length, and therefore presumably the stature, of the general female population steadily decreased all through the history.

Besides these changes, which were more or less progressive, there were others of a less stable and more transient kind. The least variable characteristics throughout are the facial and the nasal indices, which we have seen to be the best features by which to differentiate the two races. Obviously intermarriage slightly affected the two respective stocks at various times, so that occasionally the negroid influence broadens the face and nose of the non-negroid part of the population by a unit or two, and vice versa. But there seems to be always a strong tendency to revert to the original types, and accordingly in the Roman period, the latest with which we deal, the facial features of the two individual race-stocks reappear each in their most pronounced form.

In contrast with the characteristics of the *face*, those of the *cranium* vary greatly. The capacity and the cephalic index seem to be closely correlated, and a rise in the one is generally accompanied by a rise in the other. In this connexion it may be observed that it is cranial capacity alone which serves to distinguish the skulls of the superior social classes from those of the inferior folk. This is particularly noticeable when the Abydos specimens of the Twelfth to Fifteenth and the Eighteenth Dynasties are compared with those of the same date from other sites.

If it is borne in mind that these particular differences in cranial capacity are due to distinctions of class and standing it will be difficult to say that there has been a progressive change in the cranial characteristics, with one exception, which is that, between the Early Predynastic period and the First Dynasty, there is a steady rise in cranial capacity (to some extent accompanied by a rise in cephalic index) to be observed both in the males and in the females. Such evidence as is available does not suggest that this is due to increase in stature; for though the femoral length of the First Dynasty males is apparently greater than usual (in a series which is too small to admit of safe conclusions), that of the females remains unchanged. We may therefore reasonably regard this increase in cranial capacity as due to the influence of civilization and higher culture, which seems to have affected the

negroid more than the non-negroid men; although the women, of whichever race-stock they might be, participated equally in the improvement.

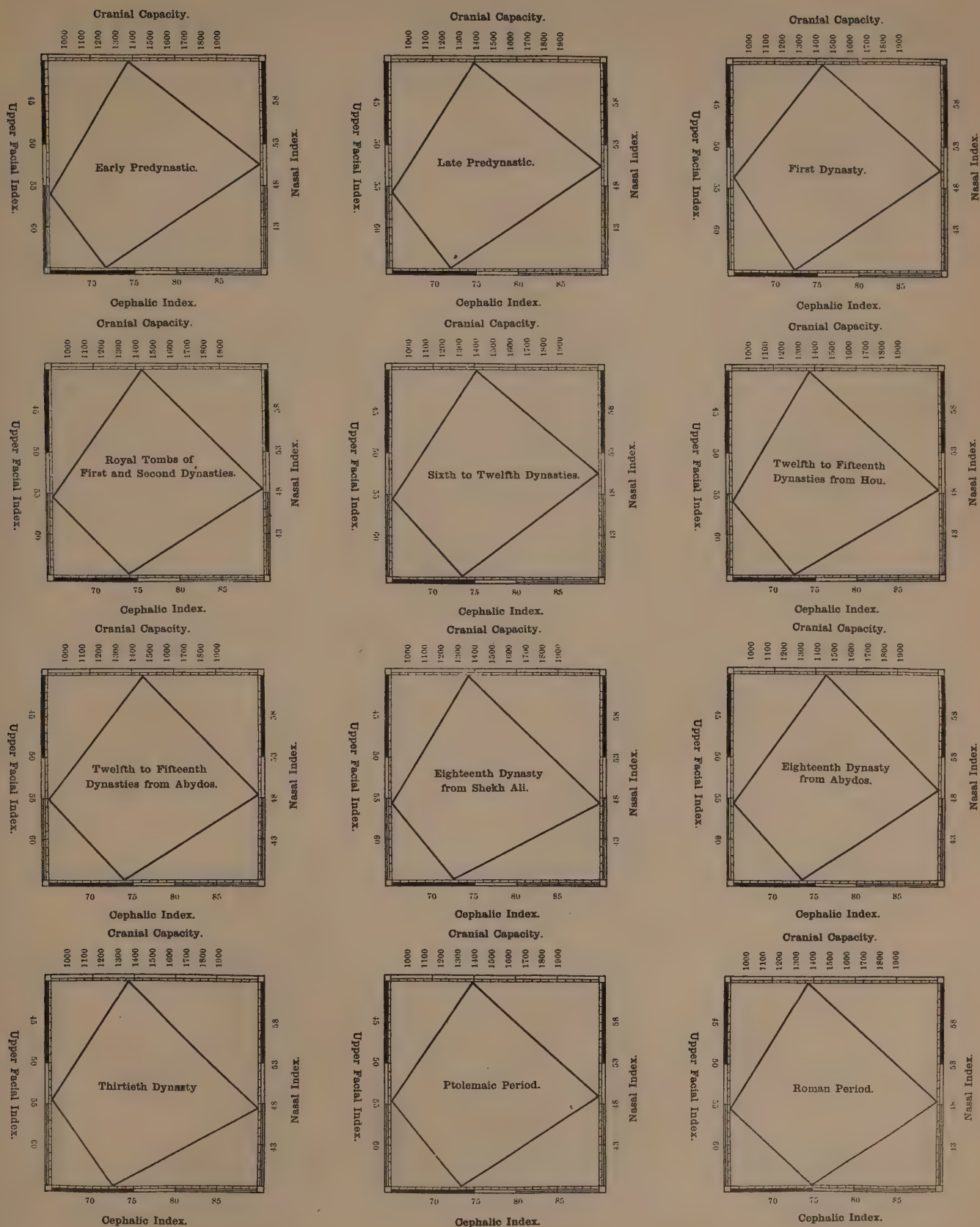
The increase in the size of the head, which we have ventured to attribute to the intellectual development that took place at the time, is not consistently maintained in the subsequent periods, some of which indeed afford evidence of marked deterioration. In the Roman age there are certain differences in the cranial characteristics which are probably due rather to alien blood than to natural development and may therefore be considered separately.

Apart from the results of culture and civilization we must not neglect to mention the occasional effects of alien immigrations, though they are not nearly so pronounced as might have been expected and have only a temporary significance. Our analysis has revealed at times the presence of isolated groups analogous to the occurrence of distinct colonies or the intrusion of people of allied stock, but it is not till the Roman period that the influx of an alien race can be detected. The negroid element in the population was always much less stable than the non-negroid, and was probably recruited more than once from different tribes. Thus at Hou there was the remarkable circumstance of the settlement amid the established population of another negroid colony. Again in the Early Predynastic series the negroid females were slightly different from the most typical representatives of the stock. And there is some reason to think that the decline of the native women in physique led to a demand for negroid mistresses, who were obtained from foreign sources. Lastly, in the Roman period there is the striking fact that negroid men appear who belong to a type which is superior in cranial development to that of the contemporary natives.

In contradistinction to these minor variations, which are confined to the negroid stock, there are two cases in which a foreign intrusion may be observed. One is at Regagnah in the Third and Fourth Dynasties, where there was a settlement of large-headed men who, as we have seen reason to suppose, were brought from Middle or Lower Egypt for a special purpose. The other case occurs among the non-negroid males of the Roman period, whose narrower face and nose and straighter profile are suggestive of just such a foreign influence as the historical circumstances would lead the reader to expect.

MALES

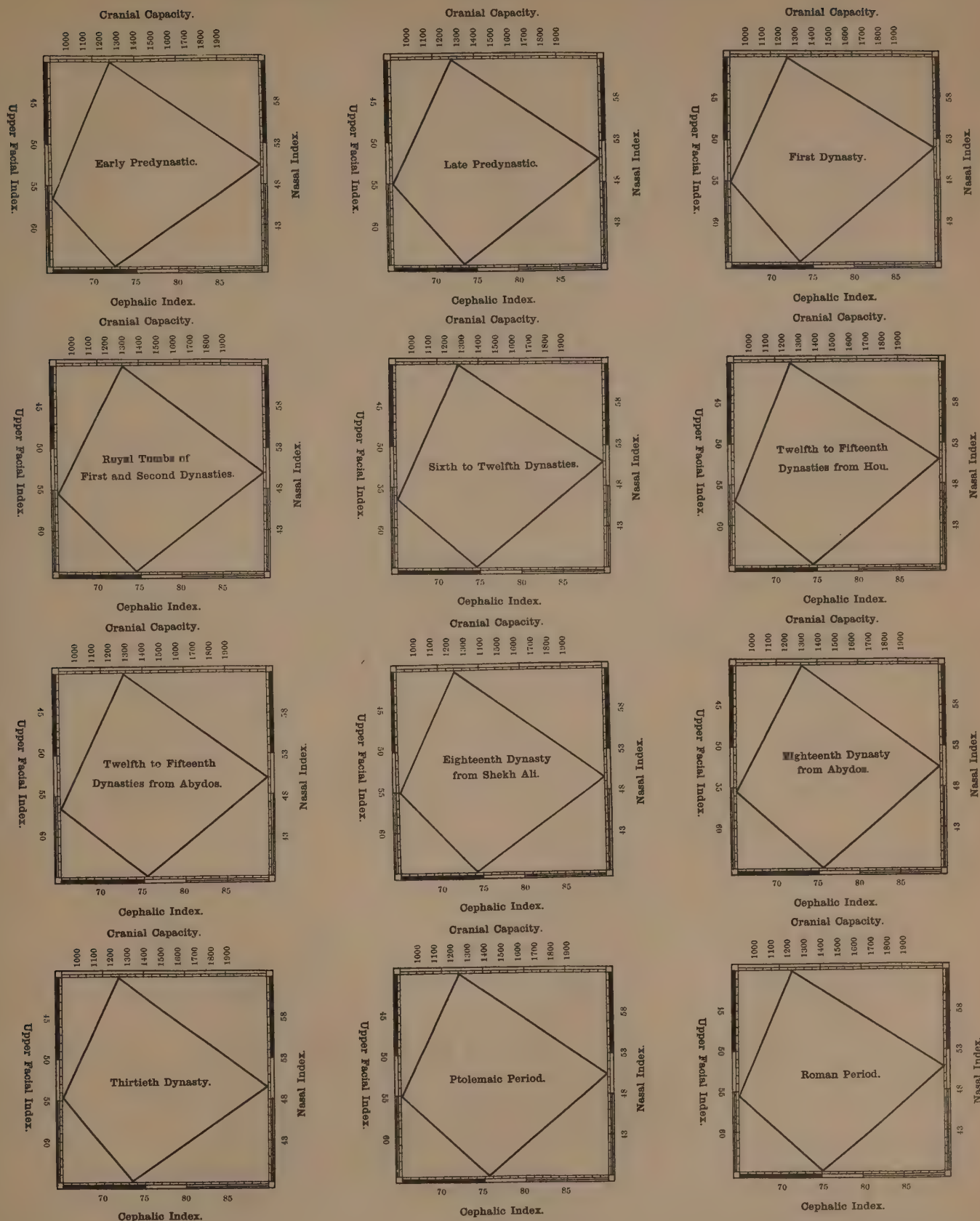
Before the series have been analysed into their component groups.



Diagrams showing the correlations between Cranial Capacity, Cephalic Index, Upper Facial Index, and Nasal Index in the several periods.

FEMALES

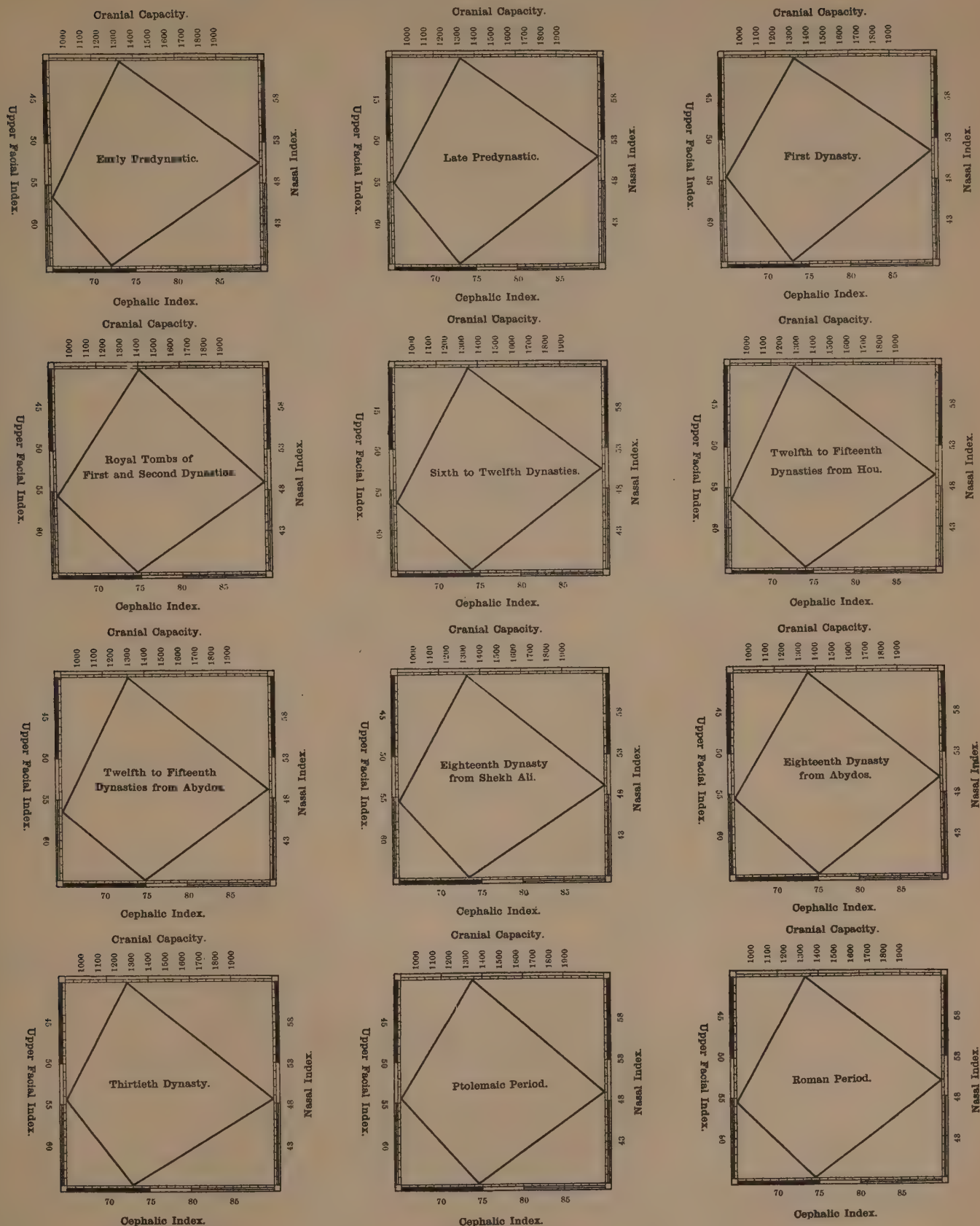
Before the series have been analysed into their component groups.



Diagrams showing the correlations between Cranial Capacity, Cephalic Index, Upper Facial Index, and Nasal Index in the several periods.

MALES AND FEMALES (combined)

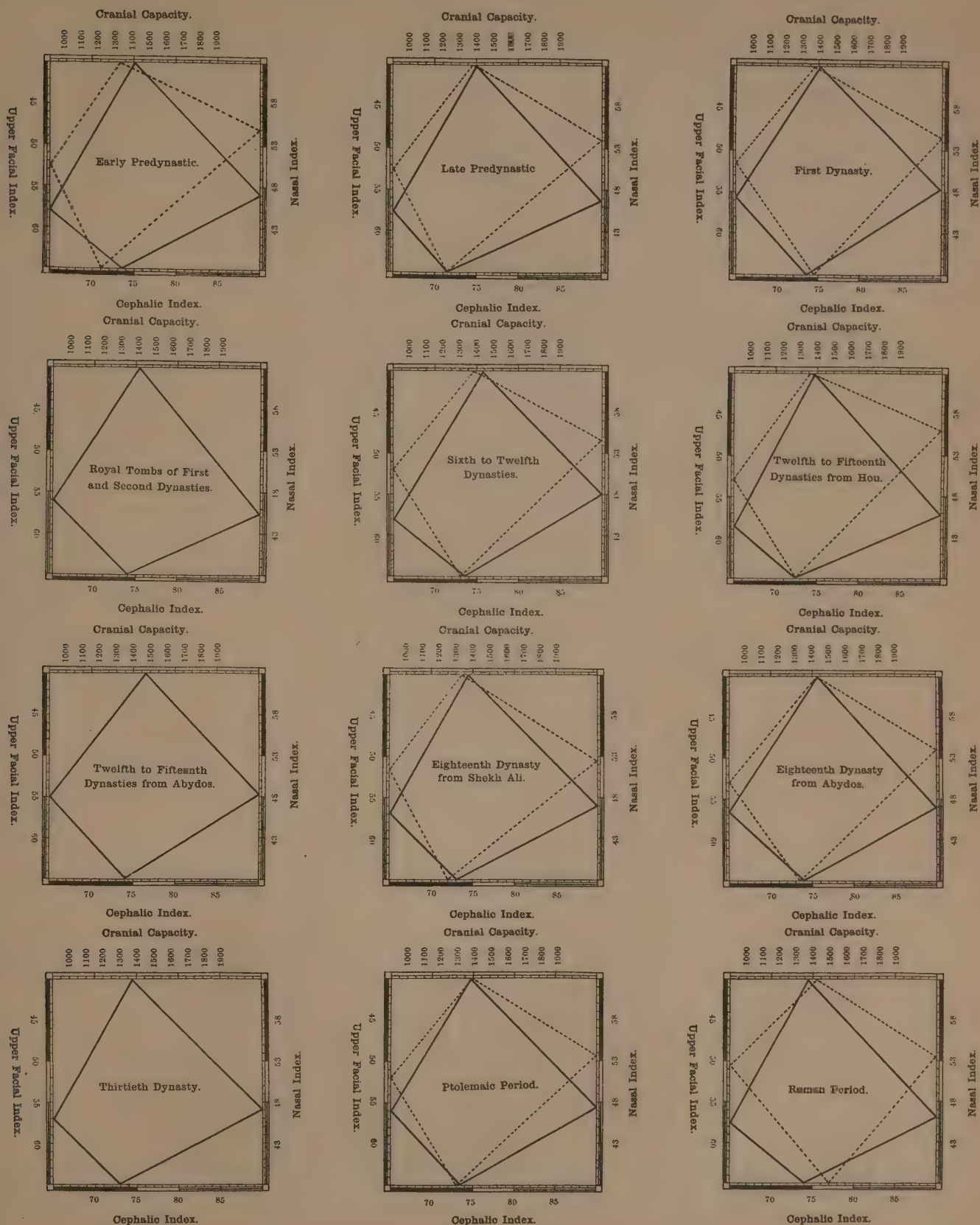
Before the series have been analysed into their component groups.



Diagrams showing the correlations between Cranial Capacity, Cephalic Index, Upper Facial Index, and Nasal Index in the several periods.

MALES

In their two chief component groups, viz. group 1 indicated by a dotted line, and group 2 by a solid line.
Group 1 is negroid, Group 2 is non-negroid, see p. 86.

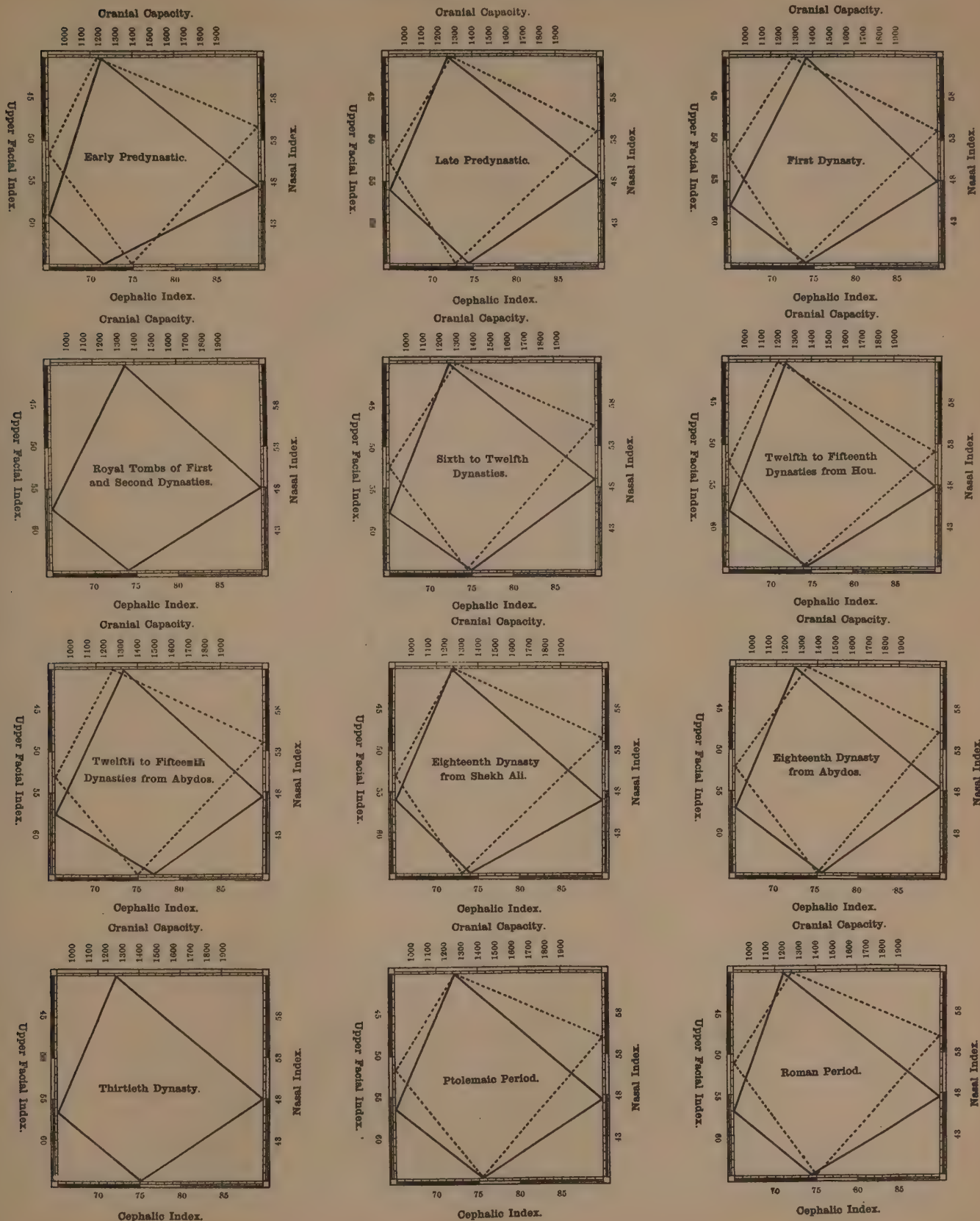


Diagrams showing the correlations between Cranial Capacity, Cephalic Index, Upper Facial Index, and Nasal Index in the several periods.

FEMALES

In their two chief component groups, viz. group 1 indicated by a dotted line, and group 2 by a solid line.

Group 1 is negroid, Group 2 is non-negroid, see p. 86.

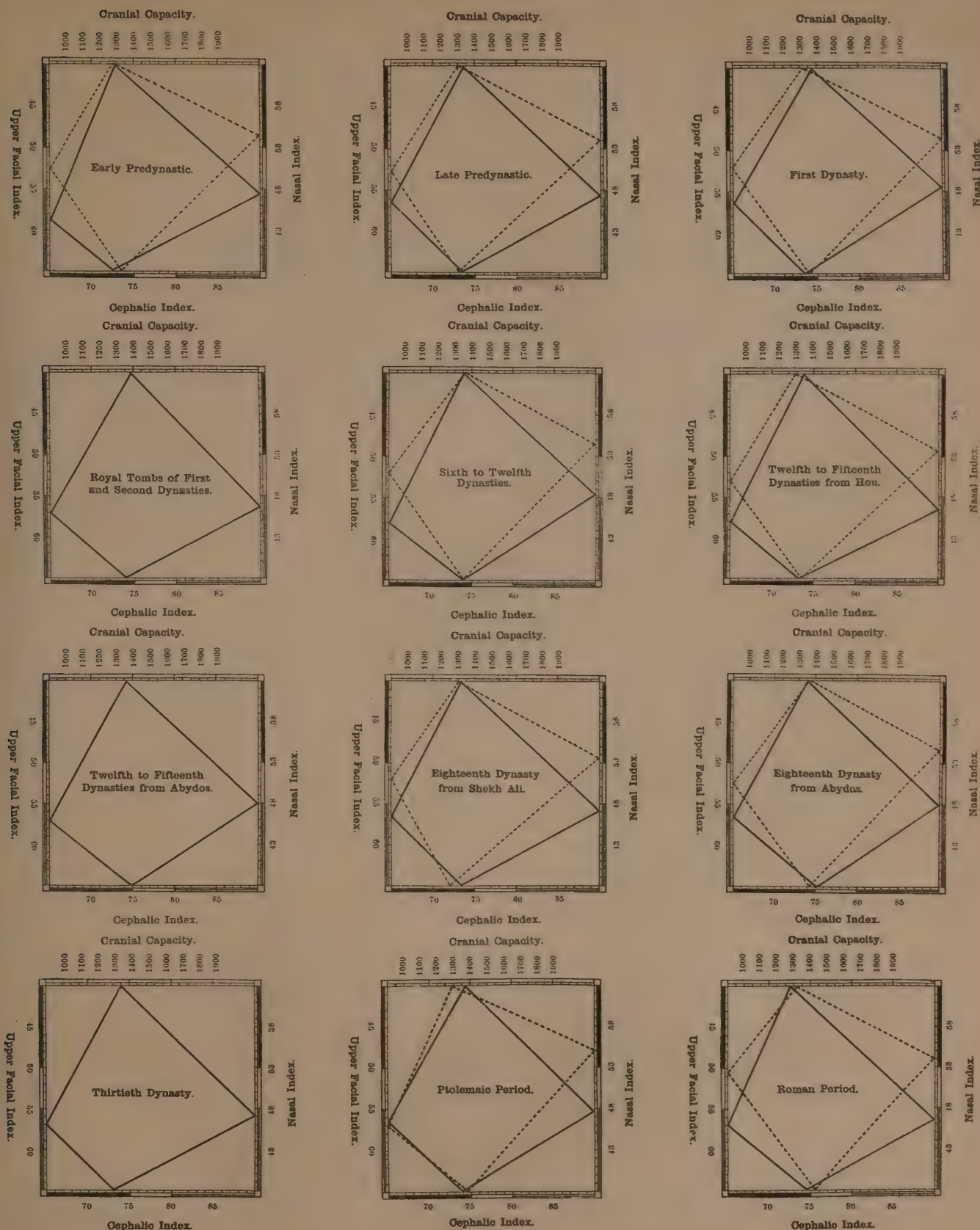


Diagrams showing the correlations between Cranial Capacity, Cephalic Index, Upper Facial Index, and Nasal Index in the several periods.

MALES AND FEMALES (combined)

In their two chief component groups, viz. group 1 indicated by a dotted line, and group 2 by a solid line.

Group 1 is negroid, Group 2 is non-negroid, see p. 86.



Diagrams showing the correlations between Cranial Capacity, Cephalic Index, Upper Facial Index, and Nasal Index in the several periods.

APPENDIX

BIBLIOGRAPHICAL REFERENCES, DETAILS OF TOMBS, AND NOTES IN AMPLIFICATION OF STATEMENTS MADE IN THE PRE- CEDING PAGES

COMPLETE ENUMERATION OF THE MATERIAL

Made up of 1,715 specimens.

	Skulls ♂.	Skulls ♀.	Skeletal parts be- longing to skulls.		Skeletal parts not belonging to heads.	
<i>Early Predynastic.</i>						
From El Amrah	10	8	♂4	♀2	29	
From Hou	24	26	♂12	♀14	2	
From Abydos	20	27	♂19	♀24	15	(= 161 specimens)
<i>Late Predynastic.</i>						
From El Amrah	28	26	♂8	♀8	44	
From Hou	99	110	♂59	♀66	none	(= 307 specimens)
<i>First Dynasty.</i>						
From El Amrah	12	26	♂5	♀5	12	
From Hou	17	12	♂15	♀12	none	
From Abydos	14	23	♂4	♀10	17	(= 133 specimens)
<i>Royal Tombs of First and Second Dynasties.</i>						
From Abydos	27	15	none		16	(= 58 specimens)
<i>Third and Fourth Dynasties.</i>						
From Regagnah	11	6	♂8	♀6	1	(= 18 specimens)
<i>Fourth and Fifth Dynasties.</i>						
From Medum and Deshasheh	54	9	none		none	(= 63 specimens)
<i>Sixth to Twelfth Dynasties.</i>						
From Denderah	175	149	♂138	♀103	9	(= 333 specimens)
<i>Twelfth to Fifteenth Dynasties.</i>						
From Abydos	11	32	none		none	
From Hou with Pan-tombs .	57	56	♂57	♀54	8	(= 164 specimens)
<i>Eighteenth Dynasty.</i>						
From Abydos	50	67	none		none	
From Shekh Ali	41	47	none		none	(= 205 specimens)
<i>Thirtieth Dynasty.</i>						
From Hou	16	16	♂8	♀8	none	(= 32 specimens)
<i>Ptolemaic period.</i>						
From Denderah	78	62	♂24	♀16	1	(= 141 specimens)
<i>Roman period.</i>						
From Denderah	50	50	♂8	♀14	none	(= 100 specimens)
Totals	Male skulls. 794	Female skulls. 767	Male skeletons. 369	Female skeletons. 342	Other skeletons without heads. 154	Grand total. 1715

DETAILS OF TOMBS AND BIBLIOGRAPHICAL REFERENCES

IN the brief sketch of the history and archaeology contained in Chapter I of the text, a general account has been given of the cemeteries from which the specimens were obtained. Those, however, who wish to form a complete idea of the character of the various sites and of the graves belonging to them should consult the special memoirs in which the excavations are described. The following references will aid the student who intends to pursue this subject.

The Predynastic Periods and the First Dynasty.

The specimens which compose these series were obtained from three nearly contiguous sites in Upper Egypt, viz. the district extending from Hou to Semaineh (described for brevity merely as Hou), Abydos, and El Amrah.

The excavations at Hou are recorded in *Diospolis Parva*, by W. M. Flinders Petrie, special extra publication of the Egypt Exploration Fund, London, 1901 (especially pp. 31-36), and those at Abydos and El Amrah in *El Amrah and Abydos*, by D. Randall-MacIver and A. C. Mace, special extra publication of the Egypt Exploration Fund, London, 1902 (especially pp. 15-30 and pp. 53-55).

To the Hou series belong the cemeteries lettered respectively B, H, R, while cemeteries ϕ and χ were at Abydos and a and b at El Amrah. In the following list the first column gives the number by which the specimen is denoted in our diagrams and tables of measurements, the second gives the letter of the cemetery and the number by which the grave was entered in the excavator's published or unpublished notes, the third column gives the 'sequence-dating.' In the fourth column the letters used refer to the comparative richness or poorness of the grave, pp. meaning 'very poor,' p. 'poor,' av. 'average,' r. 'rich,' rr. 'very rich.'

It has seemed desirable to quote the details of sequence-dating and tomb-character in the interest of those who may possibly wish in the future to re-arrange the material upon a different basis, and we must here acknowledge the courtesy of Professor W. M. Flinders Petrie in allowing us to use unpublished records of the Hou cemeteries. Sequence-dating is, of course, only possible when the tombs contain a representative equipment of pottery or other objects. Consequently many of the specimens which occur in the tables of measurements will not be found in the following list, but the tomb-numbers and the excavator's notes are extant and can be produced if occasion should ever arise. Those specimens which did not admit of precise sequence-dating have been assigned to the 'Late Predynastic' series, which, as has been said in the text, is so far ill-defined that it includes a considerable number of these indeterminate examples¹.

The Early Predynastic, however, on the one hand and the First Dynasty on the other are confined rigidly to the limits stated, viz. the former to before sequence-date 50, and the latter to after sequence-date 70. The allocation of the specimens to their several periods was made before the measurements were drafted at all, and has never been interfered with in the course of writing. When a grave has a wide possible range of which the upper or lower limits might seem to carry it outside the class into which it has been put, it must be considered that a closer scrutiny of the contents and character of the tomb has determined its place as here given by attaching more weight to certain special factors than to others.

The division of the tombs into rich and poor is necessarily quite rough for several reasons. It is very difficult to fix a standard of comparative wealth just as it is very difficult to establish any criterion of civilization for periods or peoples; but as the classification is by the same hand throughout a certain degree of uniformity may be guaranteed. A serious embarrassment, however, has been encountered in the circumstance that so many of the graves had been plundered in ancient times. Though it is possible to form some guess as to the kind of objects which chiefly attracted the contemporary

¹ All specimens from cemetery H are at least subsequent to sequence-date 60, and no doubt some of them which have been included in 'Late Predynastic' are actually of the First Dynasty, though the evidence is not strong enough to justify their positive assignment to that period.

plunderer, yet the archaeologist will frequently be baffled to decide whether a grave which has been partially plundered when he sees it was originally rich or poor. In the following classification the fact that a grave has been plundered is generally considered sufficient to turn the balance in favour of the comparative wealth of its owner. About the very poor graves, of course, no question could arise, and to that extent the information which is here given may prove valuable.

TABLE XIV.

EARLY PREDYNASTIC MALES.

FROM ABYDOS.				FROM EL AMRAH.				FROM HOU.			
Catalogue Number.	Grave Number.	Sequence dating.	Rich or Poor.	Catalogue Number.	Grave Number.	Sequence dating.	Rich or Poor.	Catalogue Number.	Grave Number.	Sequence dating.	Rich or Poor.
1	φ 50	30-42	pp.	123	a 1130	31-52	pp.	1005	B 445	44	av. to r.
3	φ 53	31-63	pp.	181	b 237	39-46	pp.	1017	B 207	33-45	—
5	φ 83	30-37	pp.	189	b 1079	33-46	pp.	1025	B	—	pp.
7	φ 55	32-34	p.	189	b 212	86	r.	1085	B 374	48	p.
9	φ 57	early	pp.	199	b 1098	33-47	pp.	1057	B 34	35-39	av.
11	φ 69 ^b	34-46	p.	207	b 1035	38-46	pp.	1059	B 421	41-43	p.
13	φ 32	before 57	pp.	217	b 196	34-47	pp.	1069	B 107	88	av.
15	φ 9	33-62	pp.	219	a 146	34-41	pp.	1075	B 204	33-45	—
17	φ 18	33-52	pp.	301	a 56	48-55	r.	1091	B 101	84	r.
19	φ 13	35-51	pp.	303	a 150	30-34	av.	1095	B 144	86	r.
21	φ 58	34-56	pp.					1099	B 145	86	r.
23	φ 29 ^b	33-43	p.					1103	B 203	33-45	—
25	φ 69 ^a	34-46	p.					1113	B 88	before 43	r.
27	φ 38	34-56	p.					1125	B 86	35-40	rr.
29	φ 201	early	pp.					1129	B 37	81	av.
31	φ	early	pp.					1143	B 238	43-48	r.
33	φ 27	early	pp.					1153	B 377	34-51	p.
35	φ 15	31-50	p.					1155	B 382	31-48	p.
37	φ 81	33-38	p.					1159	B 230	35-37	p.
39	φ 29 ^a	33-43	p.					1187	B 443	44	p.
								1203	B 115	31-50	p. or av.
								1211	R 103	41-48	p.
								1247	R 127 ^b	34-47	p.
								1251	R 29 ^a	40-44	av.

EARLY PREDYNASTIC FEMALES.

2	φ 35	early	pp.	126	b 1100	30-47	pp.	1002	B 338	43	—
4	φ 39	30-47	pp.	168	b 207	49	av. to r.	1010	B 336	44	p.
6	φ 47	34-56	pp.	174	b 186	34-50	p.	1020	B 504	36-44	pp.
8	φ	early	pp.	176	a 148	early	pp.	1026	B 393	circa 51	—
10	φ 17	31-(63?)	pp.	254	b 1063	30-47	pp.	1054	B 334	39	pp.
14	φ 73	31-48	pp.	302	a 11	40-50	av.	1066	B 256	42	p.
16	φ 49	30-43	pp.	304	a 1054	35-46	pp.	1078	B 108	33	—
18	φ 79	30-37	p.	306	a 140	42-43	av.	1082	B 118	33-48	av.
20	φ 72	early	pp.					1086	B 53	31-48	av.
22	φ 65	33-(62?)	pp.					1088	B 65	45	p. or av.
24	φ 1005	early	pp.					1118	B 78	33	av.
26	φ 1006	early	pp.					1126	B 109	44	r.
28	φ 25	31-55	pp.					1144	B 148	38-34	pp.
30	φ 10	30-43	pp.					1146	B 116	31-48	pp.
32	φ 300	early	pp.					1148	B 118	33-48	av.
34	φ 82	31-51	pp.					1154	B 126	33-48	pp.
36	φ 52	33-43	pp.					1160	B 226	37	pp.
38	φ 66	36-43	pp.					1164	B 349	41	p.
40	φ 42	41-46	pp.					1166	B 362	41-53	p.
42	φ 77	34-56	pp.					1170	B 250	41-45	p.
44	φ 84	32-44	pp.					1172	B 225	30-37	pp.
46	φ 30	35-38	pp.					1202	B 211	33-38	pp.
48	φ 28	34-50	pp.					1226	R 126	35-37	—
50	φ 48	30-50	pp.					1244	R 127 ^a	34-47	pp.
52	φ 12	31-51	pp.					1254	R 104	36-48	pp.
54	φ 7	35-36	av. to r.								
56	φ 3	34-55	av. to r.								

TABLE XV.
LATE PREDYNASTIC MALES.

FROM EL AMRAH.				FROM HOU.			
Catalogue Number.	Grave Number.	Sequence-dating.	Rich or Poor.	Catalogue Number.	Grave Number.	Sequence-dating.	Rich or Poor.
115	b 1018	31-63	pp.	1001	B 224	—	pp.
117	b 1063	33-62	pp.	1003	B 146	—	p.
125	b 232	60-66	r.	1013	B	—	pp.
133	b 223	63-64	p.	1015	B	—	pp.
135	b 112	47-70	av.	1019	B	—	pp.
137	b 36	61-63	av. to r.	1021	B	—	pp.
141	b	—	p.	1023	B	—	pp.
145	b 227	63-64	r.	1027	B 418	89	pp.
153	b 211	33-61	p.	1029	B	—	pp.
155	b 233	60-66	av.	1031	B	—	pp.
167	b 1065	41-70	pp.	1033	B	—	pp.
175	b 113	63-64	av.	1037	B	—	pp.
183	a 1123	31-68	pp.	1039	B 430	60?	pp.
211	b 1008	—	pp.	1041	B 221	—	pp.
213	b 208	48-65	r.	1043	B	—	pp.
221	b 1013	before 70	p.	1051	B	—	pp.
251	b	—	pp.	1055	B	—	pp.
255	b	—	pp.	1061	B	—	pp.
257	b	before 70	pp.	1063	B	—	pp.
305	a 1029	—	pp.	1065	B	—	pp.
307	a 1121	—	pp.	1071	B	—	pp.
309	a 154	53-66	p.	1073	B	—	pp.
311	a 1138	—	pp.	1079	B	—	pp.
313	b 61	38-67	pp.	1081	B	—	pp.
315	b 39	44-64	r.	1083	B 131	—	av.
317	a 1041	31-61	p.	1087	B	—	pp.
319	b 1003	—	pp.	1089	B	—	pp.
				1093	B 220	—	pp.
				1097	B 360	52-76	av. to r.
				1101	B 251	63	av. to r.
				1109	B 129	—	p.
				1117	B	—	pp.
				1121	B	—	pp.
				1127	B 79	—	av.
				1141	B 135	32-56	p.
				1145	B	—	pp.
				1163	B 258	53	p.
				1165	B 259	—	pp.
				1169	B 426	61	p.
				1171	B 328	53	r.
				1179	B	—	pp.
				1181	B 402	65-78	pp.
				1183	B 422	52	p.
				1185	B 440	42-66	av.
				1189	B 365	51	p.
				1191	B 345	63	av.
				1199	B 446	—	pp.
				1205	B 213	—	pp.
				1209	B	—	pp.
				1217	R 161	65-67	pp.
				1223	R	—	pp.
				1227	R 143	38-53	pp.
				1237	R 157	65-76	pp.
				1239	R 168	—	pp.
				1241	R 166	—	pp.
				1243	R 138	79?	pp.
				1245	R 110	30-47	pp.
				1249	R 78	53-78	pp.
				1253	R 33	65-80	pp.
				1255	R 53	65?	pp.
				1257	R 39	43-70	pp.
				1259	R 41	58	p.
				1261	H 61	—	pp.
				1265	H	—	pp.
				1267	H 34	—	p.
				1271	H 127	—	p.
				1281	H 100	—	p.
				1285	H 64	—	pp.
				1291	H 107	—	pp.
				1295	H 71	—	pp.
				1297	H 109	—	pp.

LATE PREDYNASTIC FEMALES.

112	b 1111	before 70	pp.	1006	B 147	—	p.	1138	B 191	46-60	av.
118	b 1110	before 70	pp.	1012	B 435	35-61	av.	1142	B 193	41-73	av.
123	b 1114	42-73	av. to r.	1014	B 194	53	av.	1152	B 212	—	pp.
134	b 200	30-60	p.	1018	B	—	pp.	1156	B 309	50	p. or av.
138	a 124	44-61	av.	1022	B	—	pp.	1162	B 218	—	pp.
148	b 1112	before 70	p.	1024	B	—	pp.	1168	B 301	41-73	av.
150	a 123	36-63	p.	1028	B 332	—	—	1178	B 322	48-74	—
164	b 224	60-67	r.	1030	B	—	pp.	1183	B 442	36-68	pp.
168	b 1016	before 70	pp.	1032	B 375	39-60	pp.	1190	B 437	32-63	—
170	b 1053	33-62	pp.	1034	—	—	—	1196	B 400	58	p.
178	b 188	47-59	av.	1036	B 389	—	—	1200	B 442	36-68	pp.
250	a	before 70	pp.	1038	B 415	63	p.	1204	B 429	51	p. or av.
252	b	—	pp.	1040	B 221	—	pp.	1210	B	—	pp.
256	b 1109	before 70	pp.	1042	B 873	63	pp.	1212	R 95	46-57	pp.
260	a 1128	before 70	pp.	1044	B	—	pp.	1214	R 97	62-72	pp.
303	a 48	—	pp.	1046	B 425	53	p.	1216	R 116	65-75	av.
310	a 76	40-64	?	1050	B	—	pp.	1218	R 99	48-58	av.
312	a 1115	44-61	pp.	1052	B	—	pp.	1220	R 171	60-73	p.
314	a 1112	36-63	pp.	1056	B	—	pp.	1222	R 118	43-70	pp.
316	b 17	56-64	r.	1060	B	—	pp.	1224	R 129	67-78	r.
318	b 52	44-57	?	1062	B 303	—	—	1232	R 114	58-68	p. to av.
320	a 24	42-70	?	1064	B 307	41-70	p.	1234	R 140	—	av.
322	a 96	56	rr.	1068	B 121	57	av. to r.	1236	R	—	pp.
324	a 93	31-61	pp.	1070	B	—	pp.	1246	R 147	45?	pp.
326	a 1010	—	pp.	1072	B	—	pp.	1248	R 133	52-63	pp.
				1074	B	—	pp.	1250	R 91	49-53	pp.
				1076	B	—	pp.	1256	R 88	60-66	av.
				1084	B 31	38-67	pp.	1258	R 82	49-63	p.
				1090	B	—	pp.	1260	R 33	59-76	p. to av.
				1094	B	—	pp.	1262	H 53	—	p.
				1096	B 178	38-68	—	1264	H 42*	—	p.
				1098	B	—	pp.	1268	H 50	—	p.
				1100	B	—	pp.	1272	H 51	58-80	av.
				1104	B 21	—	r.	1276	H 30	—	p.
				1106	B 378	52	r.	1280	H 125	—	p.
				1108	B 260	53	p.	1284	H 72	—	pp.
				1110	B 417	60	av.	1286	H 82	—	?
				1112	B 67	42-56	—	1294	H	—	p.
				1114	B 158	63	av.	1296	H 75	—	p.
				1122	B 57	—	r.	1298	H 116	—	p.
				1128	B 186	63	av.				

TABLE XVI.

FIRST DYNASTY. MALES.

FROM ABYDOS.				FROM EL AMRAH ¹ .			FROM HOU.			
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Sequence-dating.</i>	<i>Rich or Poor.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Rich or Poor.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Sequence-dating.</i>	<i>Rich or Poor.</i>
57	X 54	78	av.	127	b 133	p.	1101	B 251	68	av.
59	X 55	78	av.	159	b 1077	pp.	1105	B 407	71	pp.
61	X 44	72	r.	511	b 145	av.	1107	B 441	68	pp.
63	X 83	72	av.	513	b 99	p.	1157	B 379	66	av.
65	X 57	78-80	p.	517	b 185	av.	1181	B 402	65-78	—
67	X 56	70-78	r.	519	b 10	r.	1213	R 163	73-76	p.
69	X 1026	—	pp.	521	b 70	av.	1219	R 18	70-80	p.
71	X 35	72	av.	523	b 131	p. to av.	1221	R 144	75-79	?
73	X 3	60-68	av.	525	b 140	av.	1225	R 48	71-80	?
75	X 64	74	pp.	527	b 146	p.	1231	R 123	69-71	av.
77	X 1	62-68	av.				1235	R 149	72-78	av.
79	X 1025	—	pp.				1263	H 45	77	pp.
81	X 1039	—	pp.				1275	H 59	79	p.
83	X 67	70?	pp.				1279	H 128	77	pp.
							1283	H 39	72	av.
							1287	H 62	79	av.
							1289	H 99	75	av.

FIRST DYNASTY. FEMALES.

58	X 52	75	p.	154	a 126	r.	1130	B 233	69	av.
60	X 70	72-78	av.	500	e 2	av.	1238	R 157	65-76	pp.
62	X 64	74	pp.	502	b 170	p.	1240	R 162	circa 68	pp.
64	X 60	78	p.	504	b 1	pp.	1242	R 138	79	pp.
66	X 41	70-80	p.	506	b 121	pp.	1252	R 124	69-75	p. to av.
68	X 21	72-78	p.	510	b 177	p.	1266	H 56	72	av. to r.
70	X 25	—	av. to r.	512	b 176	pp.	1270	H 36	78	av. to r.
72	X 8	80	p.	514	e 1	p.	1274	H 55	72	p. to av.
74	X 29 ^b	66-71	av.	516	e 3	p.	1282	H 63	65-78	av.
76	X 29 ^a	possibly of later date	—	518	b 58	p.	1288	H 103	78	av.
				520	b 30	pp.	1290	H 111	77	av.
78	X 4	60-72	p.	522	b 4	pp.	1292	H 90	80	r.
80	X 5	62-65	p.	524	b 7	pp.				
82	X 61	73-78	pp.	526	b 148	p.				
84	X 67	after 70	pp.	528	b 76	pp.				
86	X 6	58-78	pp.	530	b 50	r.				
88	X 47	—	pp.	540	b 133	p.				
90	X 79	60-73	pp.	542	b 40	pp.				
92	X 10	72	av.	544	b 30	pp.				
94	X 1022	—	pp.	546	b 123	pp.				
96	X 43	78	av.	548	b 7	pp.				
98	X 42	70-80	pp.							
100	X 49	78-80	p.							
102	X 66	73	p.							

¹ It is needless to give detailed sequence-dates to these. The exact evidence for dating will be found in the archaeological memoir referred to.

The Royal Tombs of Abydos.

Our series contains, so far as can be known, no skulls or skeletons of kings, but only those of their attendants or courtiers. The excavations are fully described in two volumes by W. M. Flinders Petrie, viz. *The Royal Tombs of the First Dynasty* (Eighteenth Memoir of the Egypt Exploration Fund, London, 1900), and *The Royal Tombs of the First and Second Dynasties* (Twenty-first Memoir of the Egypt Exploration Fund, London, 1901).

The following list gives in the second column the letter denoting the particular Royal Tomb to which the specimen belonged, and the number of the chamber in which it was found. In the third column are stated the references, not only to pages, but also to plates of illustrations, in the two archaeological memoirs; Arabic numerals being used for the text and Roman numerals for the plates. The mark ‡ means that the illustration in question is only a plan, the asterisk * means that some object of the tomb-equipment is figured.

TABLE XVII.

ROYAL TOMBS OF FIRST AND SECOND DYNASTIES.

MALES.			FEMALES.		
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoirs.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoirs.</i>
402	O 2	vol. ii, 8, 9, LX ‡	403	O	vol. ii, 8, 9, LX ‡
405	O 8	" "	404	T 5	vol. i, 11, 28; vol. ii, 9, 11, LXII ‡
406	O	" "	407	O 11	vol. ii, 8, 9, LX ‡
408	O 11	" "	410	O	" "
409	O †	" "	411	T	vol. i, 11, 28; vol. ii, 9, 11, LXII ‡
412	O 22	" "	413	—	
414	O	" "	423	W 57 ^a	vol. i, 8, LXI ‡, XLIII
415	O	" "	426	Q 6	vol. i, 14, 15, LX ‡, XLII *
417	O	" "	428	Q 7	vol. i, 14, 15, LX ‡
418	T	vol. i, 11, 28; vol. ii, 9, 11, LXII ‡	432	Q 21	" "
419	O †	vol. ii, 8, 9, LX ‡	437	M 1002	
420	O 13	" "	439	X 51	vol. i, 12, LX ‡, LXI ‡, XXIII *
421	Q 8	vol. i, 14, 15, LX ‡, XLI *	440	W 57 ^b	vol. i, 8, LXI ‡, XLIII *
425	Q 4	vol. i, 14, 15, LX ‡, XLI *; vol. ii, XLVI *	460	Q 14	vol. i, 14, 15, LX ‡
430	M 1000		478	V 19	vol. i, 13, LXIII ‡
436	W 40	vol. i, 8, LXI ‡			
447	X 57	vol. i, 12, LX ‡, LXI ‡			
453	MK				
457	W 8	vol. i, 8, LXI ‡			
459	UP				
472	O 1	vol. ii, 8, 9, LX ‡			
475	O	" "			
476	Q 17	vol. i, 14, 15, LX ‡			

The Tombs of the Third and Fourth Dynasties from Regannah are very fully described in *The Third Egyptian Dynasty*, by J. Garstang, B.A. (London: Constable and Co., 1904). The original numbers of the tombs and the pages of the memoir in which they are detailed are given in the following columns.

TABLE XVIII.

THIRD AND FOURTH DYNASTIES FROM REGAGNAH.

MALES.			FEMALES.		
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>
601	R 202	—	605	R 80	42, 47
602	R 89	46	607	R 54	41, 47
606	R 50	32	608	R 71	44, 46
610	R 82	38	611	R 55 A	52
612	R 61	38, 43	613	R 88	41, 45
615	R 72	—			
616	R 56 A	44			
617	R 68	38, 42			
618	R 55 B	52			
619	R 200	—			
620	R 66	48			

The excavations at Deshasheh are described in *Deshasheh*, by W. M. Flinders Petrie (Fifteenth Memoir of the Egypt Exploration Fund, London, 1898), and those at Medum, in *Medum*, by W. M. Flinders Petrie (London: David Nutt, 1892). We give the tomb numbers and references to the archaeological memoir for the Deshasheh specimens. The Medum graves are only briefly referred to on pp. 20 and 21 of the volume dealing with that site. The reader may be cautioned to remember that these are the only two sites in Middle Egypt; all the others with which our work deals are in Upper Egypt.

TABLE XIX.

FOURTH AND FIFTH DYNASTIES FROM DESHASHEH.

MALES.						FEMALES.		
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>
1	30	16, 18	16	E	—	55	100	16
2	114	—	17	N	—	56	D	—
3	'Anta'	4-8, 42-4	18	141	—	57	104	16, 18
4	20	16	19	130	16	58	112	16, 18
5	144	16	20	142	20, 23	59	23	20, 22
6	105	—	21	28 A	20, 21	60	?	—
7	140	16	22	A	—	61	64	20, 21
8	120	16	23	94	20, 23	62	116	20
9	C	—	24	143	20, 21	63	113	20
10	29	16, 17	25	115	16, 18, 22			
11	88	16, 17	26	1	20			
12	117	16, 17	27	21	20			
13	101	16	28	19	20, 23, 24			
14	110	16	29	22	20			
15	B	16, 17	30	28	20, 21			

Sixth to Twelfth Dynasties.

These specimens were all obtained at Denderah, and the excavations are described in *Denderah*, by W. M. Flinders Petrie (Seventeenth Memoir of the Egypt Exploration Fund, London, 1900). The memoir in question contains such a quantity of material of various kinds that comparatively few of the tombs in which we are interested have been described in detail. But to facilitate reference the plates of illustrations are here quoted (in Roman numerals) as *also* the pages of the text. As in the foregoing lists the mark † is used to denote a ground-plan, and the asterisk * to denote the illustration of a vase or other object found in the tomb.

TABLE XX.

SIXTH TO TWELFTH DYNASTIES FROM DENDERAH.

MALES.						FEMALES.					
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Reference in Archaeological Memoir.</i>
13	450	xxvii †	175	264	'Beb'	8	412	xviii *	260	543	xviii *
27	239	xvii *	182	314	20, xxxiv	50	244 A	xvii *	269	549	'Hotepa,' 19,
28	244	xvii *	185	290	xxvii †	54	312	xviii *			51, xi B, xiv,
30	271	xviii *, xxxiv †	188	274	xx *	86	461	xvii *			xxvii †
53	312	xviii *	190	275	xvii *	87	456	8, xxvi	271	538	'Rekuia,' 18,
74	272	xvii *	200	454	xxvii †	120	84	xvii *			xvii *, xxvii *
80	295	xxvii *	206	272 A	xvii *	143 B	208	xviii *	278	539	xiv
84	460	xviii *	208	271	xviii *	149	234	had stucco coffin	313	441	xvi *, xx *
119	24	xvii *	211	36 B	xviii *	155	305	xviii *	331	488	26, xx *
126	229	xviii *	217 A	4	near Addu's tomb	157	213	xvii *	338	461 A	xvii *
127	229 A	xviii *				162	81	'Ana,' 64			
129	225 D	xviii *	261	441	xvi *, xx *	172	219 B	xviii *			
144 A	234 A	had stucco coffin	270	538	'Rekuia,' 18, xvii *, xxvii †	191	219	xviii *			
145 A	232	xviii *	282	816	'Nemy,' 20, 50, 64, xxvii †	197	467	xviii *			
165	307	xvii *				201	458	xviii *			
168	218	xvii *				210	36 A	xviii *			

Five specimens in the Females, viz. Nos. 123, 162, 218, 232, 236, and two specimens in the Males, viz. Nos. 217, 231, are actually of the Sixth Dynasty.

Twelfth to Fifteenth Dynasty from Hou.

The specimens numbered 1-100 of this series were obtained from the cemetery noted as YS, which is described on pp. 50-53 of *Diospolis Parva*. Those numbered 101-122 came from the peculiar 'Pan-graves,' of which an account is given on pp. 45-49 of the same memoir; their reference numbers are as follows:—

TABLE XXI.

MALES.				FEMALES.			
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>
101	x 17	113	x 27	102 B	x 39	114	x 74
103	x 32	115	x 42	104	x 24	116	x 13
105	x 25			106	x 12	118	x 12
107	x 8			108	x 56	120	x 16
109	x 44			110 B	x 35	122	x 30
111	x 26			112	x 66		

Twelfth to Fifteenth Dynasties from Abydos.

The excavations which yielded this series of specimens are recorded in *El Arabah* by J. Garstang (London, Quaritch, 1901). The number given in the second column of the following list is that by which the grave is described in the summary upon pp. 44-46 of that volume.

TABLE XXII.

MALES.				FEMALES.			
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>
119	E 260	127	E 300	128	E 30	142	E 300
121	E 240	130	E 3	132	E 260	154	E 260
123	E 300			134	E 300	160	E 260
				140	E 300	162	E 5

Eighteenth Dynasty from Abydos.

The graves from which these specimens came are mainly described in *El Amrah* and *Abydos*; the second column of the following list gives the number by which the grave is denoted in pp. 97-102 of that volume. A few which are described in *El Arabah* are asterisked.

TABLE XXIII.

MALES.				FEMALES.			
<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>	<i>Catalogue Number.</i>	<i>Grave Number.</i>
3	*E 5	75	8	4	*E 3	92	10
11	17	77	8	14	*E 10	94	10 B
13	17	79	10 B	16	*E 11	96	10 B
15	17	81	6	28	17	98	10 B
19	14	83	10 B	30	17	100	4
21	17	85	10 B	42	14	102	8
27	14	87	6	44	14	104	6
29	17	89	6	46	17 A	106	7
31	14	91	6 A	48	14	108	7
37	17	93	7 C	50	17 A	110	6
39	13	95	6	54	13	112	6
41	13	97	13	56	13	116	6
43	13			58	13	118	6
45	13			62	13	120	7
61	10 B			84	10 B	122	6
67	10 B			86	10 B	124	13
71	6			88	8	132	8 B
73	10 B			90	10 B	134	13

The Eighteenth Dynasty specimens from Sheikh Ali are briefly referred to in *Diospolis Parva*, p. 37.

Thirtieth Dynasty.

These specimens were obtained at Hou, on the actual site of Diospolis Parva. The details of the graves have not been published, but they were chambers exactly similar to those in which the

Ptolemaic burials were found at Denderah (see below). Their equipment was poor, and in general similar to that of the Ptolemaic mummies. The style of the head-wrappings, amulets, &c., as well as the tomb-construction, shows the period to have been almost as late as the Ptolemaic; but the type of the winged scarabs and genii in blue glaze is nearer to what is known as proper to the twenty-sixth to thirtieth dynasties. This series then may confidently be dated to about the thirtieth dynasty.

Ptolemaic Period.

The excavations in the course of which these specimens were obtained are cursorily described in *Denderah*, pp. 31-33 and 54-56.

Roman Period.

These specimens were also obtained at Denderah in the same year as those of the sixth to twelfth Dynasties and of the Ptolemaic period. The graves were not of the slightest archaeological interest, and no account of them has been published. Though they contained few or no objects there can be little doubt that the graves are correctly dated. They are not Mohammedan or Coptic, but the condition of the bodies showed that they were of much later date than any of the others in our various series. This excludes the possibility that they might be pauper burials of an earlier time, even apart from the circumstance that no graves of the true Egyptian periods are quite devoid of some funerary furniture. Some at least of the specimens are probably as late as the sixth century A.D.

NOTES ON THE ORIENTATION OF THE SKULL. (See p. 35.)

As has been already stated in the text, there is an obvious difficulty in comparing the disposition of points which lie lateral to the mesial plane and those which fall within it, if there is no common point to which they can be referred. In orienting the skull according to the Frankfort-Munich plane the horizontal passes just above the external auditory meatus, and corresponds anteriorly to the inferior orbital margin. Now such a disposition of the skull is based upon the supposition that the inferior orbital margin has a fairly constant relation to other parts of the cranial and facial skeleton. The form of the orbit, however, ranges from the nearly circular (*megaseme*) to the oblong or compressed form (*microseme*), and these differences are due principally to alterations in the vertical height of the orbital aperture. The question then arises whether the variations in height are due to a rise of the lower margin or a fall of the upper edge, or a combination of both. It seemed advisable therefore to make some observations to elucidate this point. The procedure adopted was as follows. A number of skulls presenting every variety of orbital form were taken, and threads were then stretched horizontally across their orbital apertures on a level with the nasion. The threads were then retained in position by being smeared with glue and so fixed to the underlying bone. The distance of the lower margin of the orbit from the horizontally disposed thread was then measured, and, as was premised, this distance was found to vary more than the measure above the thread to the upper orbital edge. In a series of thirty-eight skulls of which this measure is recorded, a variation of as much as 13 mm. in the rise or fall of the lower orbital margin as related to the level of the nasion was observed. Since the lower orbital margin is utilized for purposes of orientation in the Frankfort-Munich plane, it follows that the disposition of the skulls by this method necessarily involves a rise and fall in the position of the nasion, and so leads to a disturbance of the cranio-facial axis. It seems to us that such an assumption is improbable, and that the level of the orbital edge is more likely to vary than the disposition of the nasion. Accepting the convenience of the Frankfort-Munich plane

¹ The specimens from Denderah of the sixth to twelfth Dynasties, the Ptolemaic, and the Roman periods have already been published in a different form in the supplementary part of 'Denderah' (Seventeenth Memoir of the Egypt Exploration Fund, London, 1900). Measurements of the limbs belonging to them are also to be found in the same volume. The specimens of the Early and Late Pre-dynastic periods from Abydos have been published in *The Earliest Inhabitants of Abydos*, by D. Randall-MacIver (Oxford, Clarendon Press, 1901).

as amply demonstrated by practical experience, it became apparent that if it was to be replaced by any system of orientation based on the disposition of points falling within the mesial plane it was necessary to establish some correlation between the two systems. For this purpose a craniophore of special design was constructed. The instrument, of which a figure is appended, proved very useful, as it enabled us to arrive at certain conclusions with regard to the disposition of the skull which are otherwise obscure.

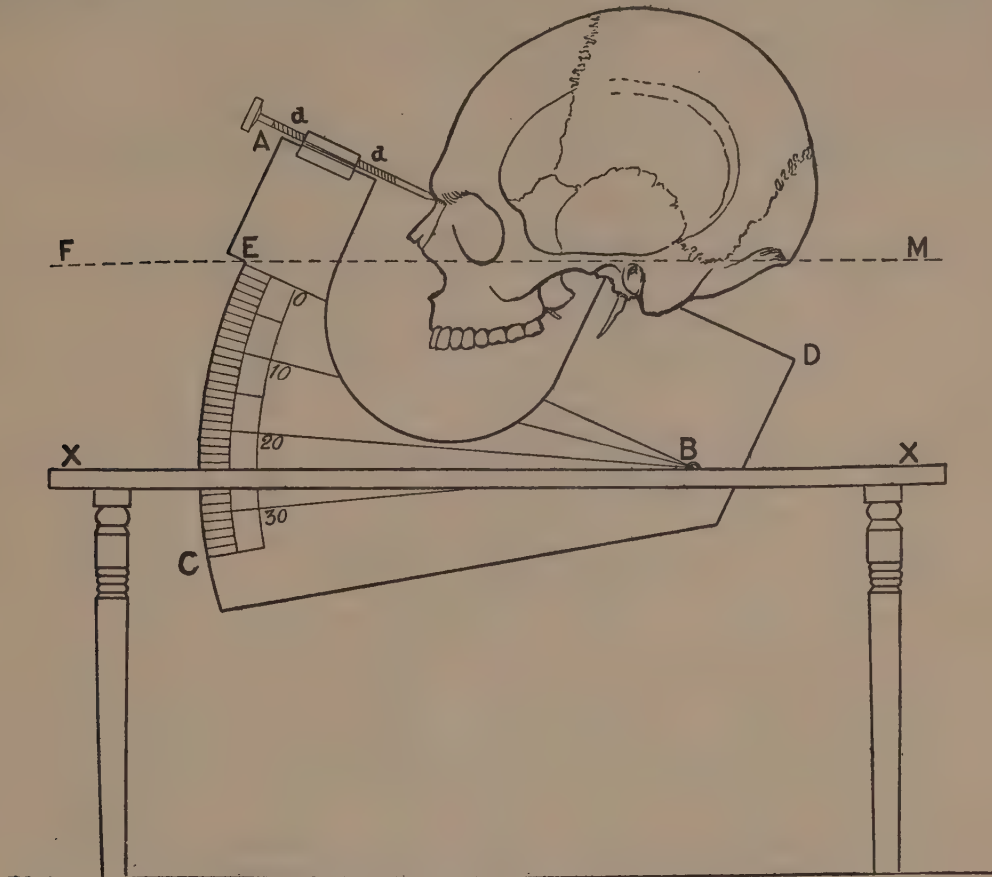


Fig. 15.

A vertical plate of metal ABC , the edge of which forms part of the circumference of a circle, of which BC is the radius. At the point B this plate is hinged to a horizontal platform XX , through a slot in which it can be raised and lowered. The upper edge of this vertical plate is provided with a means of securing the skull so that the nasion rests on an edge AD parallel to BE , whilst by means of a screw aa the skull can be pinched and so fixed at the nasion. A space in this plate has been cut away so that the face can be disposed within its circumference: the edge of the plate from E to C is marked off in degrees which can be readily noted, as the plate with the skull affixed to it is raised or lowered to a position in which the points utilized in any system of orientation fall within the horizontal plane. With the skulls affixed to this apparatus it was easy to place them in the Frankfort-Munich plane by bringing the inferior edge of the orbit level with the auricular point. Having done so, by reading the scale on the arc of the vertical plate it was easy to determine the angle formed by the basi-nasal line with the horizontal, since the skull is fixed to the upper edge of the plate in such a manner as to bring the basi-nasal line parallel to BE the radius, the extremity of which, B , corresponds to the point around which the plate revolves. On orienting the skulls in the

Frankfort-Munich plane in this apparatus, it was found by experiment that the angle formed by the basi-nasal line with the horizontal plane ranged from 22° to 34° ; by taking the mean, the angle was found to be one of about 27° .

In the table subjoined is given a record of the various observations taken, from which it appears that the largest angles formed by the basi-nasal line and the horizontal are usually met with in skulls in which the vertical height of the orbit is great, whilst the smaller angles are correlated with narrower orbits; so too, a wide angle is generally associated with an orbital index of high numerical value, a narrower angle being more frequently correlated with a low index.

TABLE XXIV SHOWING THE CORRELATION OF THE VARIOUS MEASURES OF THE ORBIT AND THE ORBITAL INDEX WITH THE ANGLE FORMED BY THE BASI-NASAL AND THE HORIZONTAL, WHEN THE SKULL IS ORIENTED IN THE FRANKFORT-MUNICH PLANE.

<i>Number.</i>	<i>Locality.</i>	<i>Orbital width.</i>	<i>Orbital height.</i>	<i>Distance from lower margin of orbit to thread.</i>	<i>Angle formed by basi-nasal line with horizontal of F.-M. plane.</i>	<i>Orbital index.</i>
I	European	39½	37	35 mm.	31.5°	94
II	"	36	32	29	30	88
III	"	37	32	26	28.5	86
IV	"	37½	33½	29	28	89
V	"	38	33	27	30	86
VI	"	39	32	28	25	82
VII	"	34½	35	30	33	100
VIII	"	36	33	25½	25	91
IX	"	39	37	34½	24	94
X	"	36	33	29	29	91
XI	"	36	30½	28	24	83
XII	"	38	32	25	25	84
XIII	"	37	31	27½	27	83
XIV	"	37	36	27½	25	97
XV	"	39	34	33	29	87
XVI	"	39	33	29½	30	84
XVII	"	40	36	30	26	90
XVIII	Egyptian	36	36	29	34	100
XIX	"	34	32	27	basion broken	94
XX	"	38	35	28	28	92
XXI	"	36	35	27	28	97
XXII	"	36	35	28	basion broken	97
XXIII	"	35	34	27	27	97
XXIV	"	39	30	27	28	76
XXV	"	37	28	26	26	75
XXVI	"	39	28	21½	25	71
XXVII	{N.American Indian}	39½	33	25	26	84
XXVIII	Tasmanian	39	30	25½	28	76
XXIX	?	38	27½	25	26	71
XXX	N. Guinea	35	34½	25	27	97
XXXI	"	39	37	30	27.5	94
XXXII	Unknown	42	38	29½	26	90
XXXIII	"	37	37	27	27	100
XXXIV	"	34	36	29½	29	105
XXXV	"	38	39	30½	28	102
XXXVI	"	38	33	22	25.5	89
XXXVII	"	38	27	21½	22	71
XXXVIII	Australian	34½	30	26½	25	88

NOTE I.

On the Relation between the Curve of Probability as presented in the form of a true Curve and in Block form. (See p. 67.)



Fig. 16.



Fig. 17.



Fig. 18.

A comparison of the figures here given for the form of the perfect curve will make apparent the fact that various differences exist. The three figures given in block form are all derived from the one true curve, and the differences which exist are due to the position of the mean relative to the main lines on the squared paper used. The first two give symmetrical results, the mean being on one of the main lines of the paper or exactly half way between them. The third figure has traces of asymmetry due to the fact that the mean does not fall in either of the two positions necessary for a symmetrical result.

An experiment upon squared paper will enable the reader to appreciate this explanation.

As the probability of the mean of any of our series falling in one of these positions is very small, very few of the Probability Curves given in this book are symmetrical.

Apart from these differences in the block form curves itself, a curve of this shape cannot be an exact representation of a true curve, but the main properties of the curve remain very approximately the same. The mean is, of course, so arranged as to be the same, and it will be found that the area and the average error in the two curves approximate very closely, a difference as large as one per cent. being very rare.

NOTE II.

The Standard Curve of Probability. (See p. 70.)

There is no *a priori* reason for taking any particular form of the Curve of Probability as the standard form, and different writers have used different forms.

One may be derived from Quetelet's figures based on the expansion of $(1+x)^{999}$. We have used this already in one instance, and it has the advantage of being the one used by other writers on this subject. Some writers unfortunately do not state what they regard as the standard form. In nearly all cases the scale of relation between the abscissae and the ordinates is determined for reasons

of convenience. Another which is sometimes used, and which has advantages from the analytical point of view, may be arrived at by reasoning as follows:—

Consider the expansion of the expression $(1+x)^n$ when n is very large; if we assume a value h for the largest coefficient in the expansion, i. e. if we assume a definite value for the maximum ordinate in the curve, the value of the p^{th} term on either side of the maximum term can be shown to be $h \times e^{-\frac{2p^2}{n}}$, where e is the base of the Napierian Logarithms and equals 2.71828182

If we express this in the ordinary language of Analytical Geometry we say that the equation of the Curve of Probability is $y = h e^{-\frac{2x^2}{n}}$, where x, y are the abscissa and ordinate of any point on the curve, i. e. its distances from two fixed perpendicular straight lines. It is a well-known theorem in Geometry that any ellipse can be transformed into any other ellipse, or into a circle, by suitable changes in the units of length taken in measuring the abscissae and ordinates. In exactly the same way all Curves of Probability can be transformed into one another, or into some Standard Curve of Probability. The most obvious form to take for the standard, from the analytical point of view, is the one in which the equation is reduced to its simplest form, namely $y = e^{-x^2}$. This has often been taken as the standard form, but to avoid the extreme smallness of the curve as defined by this equation, a difficulty which is unavoidable unless the units of measurement are inconveniently large, the ordinates and abscissae are each multiplied by the same number. This preserves the form of the curve, while we can determine its size at will.

NOTE III.

The Calculations by which a Curve of Probability is adapted to any required Series. (See p. 70.)

As shown in Appendix, Note II, by altering the units of measurement in a particular manner any Curve of Probability can be transformed into any other. The standard form of the analytical equation is $y = e^{-x^2}$, and by a suitable transformation this can

be transformed into $y = b e^{-\frac{x^2}{a^2}}$, when b and a may have any values we wish to assign to them. The

form which we use is $y = \frac{A}{c\sqrt{\pi}} e^{-\frac{x^2}{c^2}}$, where A and c

have meanings which are explained below. This form has many properties of which we can take advantage. Two quantities, then, are required to completely determine a Curve of Probability, namely A and c . As shown later, there are four quantities, $c, \eta, r,$ and ϵ , any one of which serves to determine the rest, as they are connected by numerical relations. Consequently a Curve of Probability is determined when we know A and one of the four c, η, r, ϵ . The accompanying figure will help to show what these mathematical symbols represent. The figure is that got for the Vertical Index of the Males of the Sixth to Twelfth Dynasties, and the values of the quantities are shown on Chart I, F. 2.

A is the area contained between the curve and the axis of x . The other symbol, c , is called the

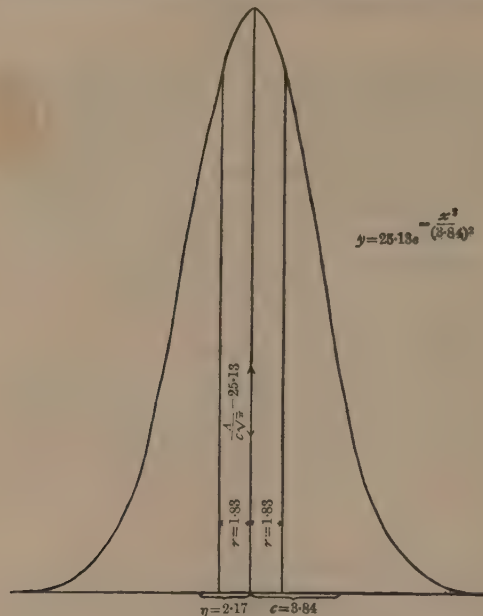


Fig. 19.

modulus of the curve, and has many important properties, but these can only be explained by considering the properties of the curve; π is of course the ratio of the circumference of a circle to its diameter. When the Curve of Probability takes this form the ordinate, y , at any point, x , does not represent the chance that an observation shall give a value represented by the position, x , of that point. We are no

longer proceeding by differences measured in units, but now any value whatever (within reasonable limits, of course) is possible. For example, in the expansion of the binomial $(1+x)^n$ the ordinates are supposed to be unit distance apart; now they are close together, and the area between two ordinates represents the chance that an observation will give a value between those represented by the feet of the ordinates. Suppose we take two ordinates very near and very nearly equal, of height y , and suppose the distances of their feet from the origin of abscissae are x and $x+dx$, where dx represents a small increment to x : then ydx or $\frac{A}{c\sqrt{\pi}}e^{-\frac{x^2}{c^2}}dx$ represents the chance that an observation

gives a value between x and $x+dx$, on the understanding that certainty is represented by A ; in other words, A is the total number of observations considered. The chance that an observation should give a value lying between x_1 and x_2 is the sum of all the expressions ydx between x_1 and x_2 , which is generally written $\int_{x_1}^{x_2} ydx$, or $\int_{x_1}^{x_2} \frac{A}{c\sqrt{\pi}}e^{-\frac{x^2}{c^2}}dx$. This therefore is the number of times we may expect to get values between x_1 and x_2 when we take A cases. If we take the limits to be at infinity in opposite directions the result of the summation is, of course, A .

Now consider the value given by any observation: suppose it differs from the mean of all the measures by δ ; then δ is the abscissa, the value of x , for this measure. The error of mean square is defined as the square root of the average of the squares of the errors, and consequently is the value of $\sqrt{\frac{\sum \delta^2}{n}}$, where $\sum$ denotes the summation for all the observations which are n in number. For

observations fitting the curve $y = \frac{A}{c\sqrt{\pi}}e^{-\frac{x^2}{c^2}}$, this is, in the language of the Integral Calculus, the square root of $\frac{\int_{-\infty}^{\infty} \frac{A}{c\sqrt{\pi}}e^{-\frac{x^2}{c^2}}dx \cdot x^2}{A} = \frac{c}{\sqrt{2}}$. Thus, calling ϵ the error of mean square, or the

standard deviation $\epsilon = \frac{c}{\sqrt{2}}$. The average of all differences, δ , from the mean, must, of course, be zero, from the definition of the word 'mean.' If, however, all these differences are supposed positive

we get an arithmetical average of the errors, which is $\frac{\sum \delta}{n} = \frac{\int_0^{\infty} \frac{A}{c\sqrt{\pi}}e^{-\frac{x^2}{c^2}}dx \cdot x}{A} = \frac{c}{\sqrt{\pi}}$. Thus

calling this arithmetical average of the errors η , we have $\eta = \frac{c}{\sqrt{\pi}}$. The probable error, r , is defined to be such that half the curve (i.e. half the expected observations) lie within a distance r on either side of the mean. For this we must have $\int_{-r}^r \frac{A}{c\sqrt{\pi}}e^{-\frac{x^2}{c^2}}dx = \frac{1}{2}A$, and the value of r is found

by trial and interpolation to be $.4769c$. We have thus four quantities, c , ϵ , η , and r , connected by definite numerical relations: when any one of these is found the other three can be calculated. As is shown in the next note, we shall find η the arithmetical average of the errors.

Then c , the modulus $= \eta\sqrt{\pi} = 1.7725\eta$;

ϵ , the error of mean square, or the standard deviation, $= \frac{c}{\sqrt{2}} = \eta\sqrt{\frac{\pi}{2}} = 1.2532\eta$;

and r , the probable error $= .4769c = .8453\eta = .6745\epsilon$.

As a consequence of this, two quantities, A and one of c , η , r , and ϵ , completely determine any Curve of Probability. The question now is how to find the values of these when we are given any series of observations; i.e. how are we to find the Curve of Probability corresponding to any Curve of Frequency. It will at once be seen that A represents the number of observations in the series; the two curves then correspond in area. They are drawn in such positions on the paper that the mean for the two occurs at the same value. It is found that it is, in general, best to make the moduli (denoted by c) of the two curves, or rather the standard deviations, from which the moduli can be derived, the same for the two curves. The practical method by which this is done will be explained in the next note.

Again

$$\eta = \frac{\Sigma \delta}{n} = \frac{6.5 + 2 \times 5.5 + 2 \times 3.5 + 2 \times 2.5 + 2 \times 1.5 + .5 + .5 + 4 \times 1.5 + 2 \times 3.5 + 1 \times 4.5 + 1 \times 6.5 + 1 \times 8.5}{20}$$

$$= \frac{1 + 9 + 5 + 14 + 4.5 + 11 + 13 + 8.5}{20}$$

$$= \frac{66}{20} = 3.30,$$

$$\therefore r = 3.30 \times .8453 = 2.79.$$

In this example the values of r found by the two methods differ by less than 5% of their value. As the number of examples in the series increases, the difference between the two values of r decreases, and the labour of finding r by the first method increases enormously. Consequently in this work we have contented ourselves with using r as found by the second method.

We will now give an account of the procedure adopted in this work to find the numerical values of the symbols explained above.

It will be advisable to start with a short *résumé* of the procedure adopted, and then to give an example fully worked out. We first determine the mean, M , of the set of observations under consideration, the number of individuals in the series being n . Then calculate $\eta = \frac{\Sigma \delta}{n}$, and from this find $r = .8453 \eta$ and $c = 1.7725 \eta$. Then find $\frac{n}{c\sqrt{\pi}} = b$ say, and $R = \frac{r}{\sqrt{n}}$.

The true value of the mean is then given as $M \pm R$, and the values of $M \pm r$ are calculated, between which half the individuals composing the series should lie. The equation of the corresponding Curve of Probability is $y = be^{-\frac{x^2}{2}}$. A few points on this curve are found, and the curve drawn in the ordinary form. From this the curve in block form is drawn, and together with the Frequency Curve is reproduced. The two curves are compared, and the percentage of misfit calculated.

The example worked out here is taken from the Vertical Index of the Males of the Sixth to Twelfth Dynasties. The specimens are arranged thus:—

66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
1	1	2	6	7	10	25	22	23	27	21	10	6	3	5	1	1 (171).

$$\text{The mean, } M, = \{1 \times 66 + 1 \times 67 + 2 \times 68 + 6 \times 69 + 7 \times 70 + 10 \times 71 + 25 \times 72 + 22 \times 73 + 23 \times 74$$

$$+ 27 \times 75 + 21 \times 76 + 10 \times 77 + 6 \times 78 + 3 \times 79 + 5 \times 80 + 1 \times 81 + 1 \times 82\}$$

$$\div 171 = \frac{12650}{171} = 73 \frac{167}{171} = 73.98.$$

η , the average error,

$$= \{1 \times 7.98 + 1 \times 6.98 + 2 \times 5.98 + 6 \times 4.98 + 7 \times 3.98 + 10 \times 2.98 + 25 \times 1.98 + 22 \times .98 + 23 \times .02$$

$$+ 27 \times 1.02 + 21 \times 2.02 + 10 \times 3.02 + 6 \times 4.02 + 3 \times 5.02 + 5 \times 6.02 + 1 \times 7.02 + 1 \times 8.02\} \div 171$$

$$= \frac{185.52 + 184.94}{171}.$$

The reason that the sum of the errors in excess is not exactly equal to the sum of the errors in defect is because the mean, M , is not exactly 73.98.

$$\text{We have, then, } \eta = \frac{370.46}{171} = 2.166 = 2.17 \text{ say.}$$

$$\text{Consequently } r, \text{ the probable error, } = 2.166 \times .8453 = 1.831 = 1.83 \text{ say.}$$

$$c, \text{ the modulus, } = \eta \sqrt{\pi} = 3.839 = 3.84 \text{ say.}$$

$$\text{And } R = \frac{r}{\sqrt{n}} = \frac{1.831}{\sqrt{171}} = .140.$$

$$\frac{A}{c\sqrt{\pi}} = \frac{A}{\eta\pi}, \text{ (since } c = \eta\sqrt{\pi}) = \frac{171}{2.166 \times \pi} = 25.13.$$

Consequently the equation of the curve of probability corresponding to this series is

$$y = 25.13e^{-\left(\frac{x}{3.84}\right)^2},$$

and the mean line is at 73.98, or practically at 74.

To draw this curve we find the values of the ordinals at points distant, $\frac{c}{2}$, c , $\frac{3c}{2}$ and $2c$ on either side of the mean, i. e. at points distant, 1.92, 3.84, 5.76, 7.68 on either side of it in the present case.

We take these points because we have

$$\begin{aligned} \text{when } x = \frac{c}{2} \quad y &= 25.13e^{-\frac{1}{4}} \\ x = c \quad y &= 25.13e^{-1} \\ x = \frac{3c}{2} \quad y &= 25.13e^{-\frac{9}{4}} \\ x = 2c \quad y &= 25.13e^{-4}. \end{aligned}$$

But as we know $c = 2.718$ approximately, we can find

$$e^{\frac{1}{4}} = 1.284$$

$$e^1 = 2.718$$

$$e^4 = 54.6;$$

and $\therefore$ when

$$x = 1.92 \quad y = \frac{25.13}{1.284} = 19.57$$

$$x = 3.84 \quad y = \frac{25.13}{2.718} = 9.25$$

$$x = 5.76 \quad y = \frac{25.13}{9.287} = 2.71$$

$$x = 7.68 \quad y = \frac{25.13}{54.6} = .46.$$

We thus get four points on each side of the mean : as we know the general shape of the Curve of Probability these points on it enable us to draw it. After being drawn in curve form it is redrawn in block form in the same figure as the Curve of Frequency.

The misfit is now calculated by adding up the areas of the differences between the two curves. In the present case we have difference of excess of Curve of Frequency over Curve of Probability

$$= .7 + 1.8 + 5.6 + 3.6 + 1.8 + 2.8 + .7 = 17,$$

and difference of defect $= .1 + .1 + .3 + 1.4 + 4.6 + 1.6 + 2.1 + 4.4 + 2.2 + 1 + .1 = 17.9.$

These should, of course, be the same, but the area of the Curve of Probability in block form is not accurately 171, but is 711.9, an error of about $\frac{1}{2}$ per cent.

The misfit, then, is 34.9, and the percentage misfit is

$$\frac{34.9 \times 100}{171} = \frac{3490}{171} = 20 \text{ approximately.}$$

In all the cases in this work the values of the Mathematical constants have been obtained in this manner, but practice enables several short cuts to be taken which simplify the work to a slight extent. It has been thought advisable to present the working here in the fullest detail.

THE NAGADA SERIES. (See p. 77.)

(Special Note by D. Randall-MacIver.)

It is impossible to allow Dr. Cicely Fawcett's essay on the Nagada crania (*Biometrika*, vol. i. no. 4) to pass without criticism. It would be out of place, indeed, to emphasize minor details on which we disagree with the author and her collaborators; but it is necessary to point out that there are fundamental errors of treatment which completely destroy any value that might be attached to this laborious study. The authors manifest throughout that peculiar prejudice, which seems ineradicable in the workers of their school, for supposing any series of observations which come under their notice

to be homogeneous in character. There is nothing whatsoever to justify this prejudice; indeed, in anthropology the *a priori* probabilities are rather on the side of the opposite hypothesis. Most anthropologists would find it hard to name any single race which is unquestionably of pure stock, and certainly the *onus probandi* must always lie with those who would maintain it to be so. But the Biometricians ignore all historical and all archaeological evidence, and habitually assume not only that series of a single locality or of a single date are representative of an entire country, and of that country throughout its whole history, but also that they represent in every case a single and homogeneous stock. Thus, on p. 409 of the memoir in question, the authors state that 'the manner in which variation is dealt with, even in such a classical work as Rüttimeyer and His's *Crania Helvetica*, is astonishing to the statistician who has realized the distribution of any character in a homogeneous population,'—as though homogeneous populations were readily to be found. And on p. 414 they treat as 'admittedly homogeneous material' such series as Broca's measurements of the skulls in the Paris catacombs and Prof. Thane's measurements of Whitechapel skulls. Surely it does not need an expert to prove that the French and the English peoples are composed of more than one race. Were it not for the blindness which is manifested in such a case as this, we might be astounded at the assumption (p. 412) that only one race-type has existed in Italy, or at the temerity which allows them to treat as pure series respectively (p. 425) not only Theban mummies and modern Egyptian skulls from a cemetery of which the history is unknown, but even modern negroes from North Africa, and worst of all a miscellany of negroes from such different localities as Algiers, the Soudan, and the West Coast of Africa. After this it seems almost venial that they should suppose mere geographical propinquity to justify them in classing certain populations as allied and others as not allied to that of Nagada.

The authors, then, have apparently not attempted to test the material selected for comparison by even such cursory procedure as they have applied to the Nagada specimens; they have simply assumed that it was of such a character as they would have wished it to be for the purposes of their work. As to the actual subject of their study, viz. the skulls from Nagada, they were indeed a little less hasty, and stated explicitly that it was important to examine whether it might fairly be treated as homogeneous or not. But the examination which was instituted with this object was most inadequate and superficial. When it is appreciated that the homogeneity of this series was the indispensable foundation of their work, it seems incredible that they should have thought it sufficient to test it by only two out of all the numerous features which were at their disposal. These two moreover, the head-length and head-breadth, were a peculiarly unfortunate selection, though no doubt the authors may be partly excused by the fact that anthropologists have long attached an exaggerated importance to the cephalic index. Even had they succeeded in proving the series to be homogeneous in regard to these two features—as in our opinion they have not—it would still be quite unjustifiable to suppose without further examination that all the other features displayed homogeneity.

And yet it was the more necessary to fully demonstrate the homogeneity of the series before proceeding to found conclusions upon that basis, inasmuch as the archaeological probabilities were rather against than in favour of the hypothesis. The specimens from Nagada range (as was fully recognized by the time Dr. Fawcett's memoir was published) over the whole of the pre-dynastic and at the least a great part of the proto-dynastic time. They ought therefore to have been treated as representative, not of a single period, but of two or three; or, if it was impossible to avoid combining the periods, it should at least have been remembered that the fact of the series being thus composite was an additional reason for suspecting its homogeneity. To such considerations, however, the authors paid no heed, and they attached apparently so little importance to the archaeological evidence of dating which was supplied to them that they have not even published it for the benefit of their readers. If the Biometricians wish to convince craniologists that their work is of scientific value they will need to treat it in a different spirit from that which is exhibited in the memoir on the skulls from Nagada.

TABLE XXV.

COMPARISON OF THE CONCLUSIONS DERIVED FROM THE STATISTICAL METHOD WITH
THE RESULTS OBTAINED BY ANALYSIS OF GROUPS. (Cf. pp. 79-85.)

	The number of specimens in each period to be assigned to the several groups.					Results as they appear in the Curves of Probability.
	Negroid.	Non-Negroid.	Intermediate.	Unclassed.	Total.	
<i>Early Predynastic. Males.</i>						
Cephalic Index	8	16	9	20	53	The most inconsistent but one of all the curves of this index for males.
Vertical Index	8	16	9	7	40	Strikingly inconsistent.
Upper Facial Index	8	16	9	0	33	Inconsistent.
Nasal Index	8	16	9	4	37	Very inconsistent.
Estimated Cranial Capacity .	8	16	9	7	40	Nearly consistent.
<i>Late Predynastic. Males.</i>						
Cephalic Index	20	36	25	44	125	The most consistent of all the curves for this index in males.
Vertical Index	20	35	24	26	105	The most consistent of all the curves for this index in males.
Upper Facial Index	20	36	25	1	82	Very consistent.
Nasal Index	20	36	25	20	101	Very consistent.
Estimated Cranial Capacity .	20	35	24	25	104	Consistent.
<i>First Dynasty. Males.</i>						
Cephalic Index	6	10	6	19	41	Fairly consistent.
Vertical Index	6	10	6	15	37	Nearly consistent.
Upper Facial Index	6	10	6	0	22	Too few for a curve.
Nasal Index	6	10	6	7	29	Too few for a curve.
Estimated Cranial Capacity .	6	10	6	13	35	An unusual concentration at the mean.
<i>Sixth to Twelfth Dynasties. Males.</i>						
Cephalic Index	30	77	37	28	172	Very consistent.
Vertical Index	31	78	37	25	171	Fairly consistent but remarkable for the great width at the apex.
Upper Facial Index	31	81	37	7	156	Inconsistent.
Nasal Index	31	81	37	14	163	The least inconsistent of all the curves of this index for males.
Estimated Cranial Capacity .	30	77	37	26	170	Consistent.
<i>Twelfth to Fifteenth Dynasties. Hou. Males.</i>						
Cephalic Index	10	31	9	5	55	Inconsistent.
Vertical Index	10	31	9	4	54	Very consistent.
Upper Facial Index	10	31	9	0	50	Consistent with irregularities of small importance.
Nasal Index	10	31	9	6	56	The least consistent of all the curves for this index for males.
Estimated Cranial Capacity .	10	31	9	4	54	Unusual concentration at the mean.
<i>Eighteenth Dynasty. Abydos. Males.</i>						
Cephalic Index	8	31	10	1	50	Very consistent.
Vertical Index	8	31	10	1	50	Fairly consistent.
Upper Facial Index	8	31	10	0	49	Extremely consistent.
Nasal Index	8	31	10	1	50	Inconsistent.
Estimated Cranial Capacity .	8	31	10	1	50	Inconsistent.
<i>Eighteenth Dynasty. Shekh Ali. Males.</i>						
Cephalic Index	8	22	7	4	41	Inconsistent.
Vertical Index	8	22	7	4	41	Fairly consistent.
Upper Facial Index	8	22	7	0	37	Consistent with irregularities of slight importance.
Nasal Index	8	22	7	2	39	Inconsistent.
Estimated Cranial Capacity .	8	22	7	4	41	Inconsistent.
<i>Ptolemaic Period. Males.</i>						
Cephalic Index	10	35	27	6	78	Fairly consistent.
Vertical Index	9	35	26	5	75	Fairly consistent, but askew.
Upper Facial Index	10	35	27	1	73	Consistent with irregularities of slight importance.
Nasal Index	10	35	27	5	77	Rather inconsistent.
Estimated Cranial Capacity .	10	35	26	3	74	Fairly consistent, but askew.
<i>Roman Period. Males.</i>						
Cephalic Index	8	21	11	10	50	The least consistent of all the curves for this index for males.
Vertical Index	8	21	11	10	50	Very inconsistent.
Upper Facial Index	8	21	11	5	45	Ambiguous.
Nasal Index	8	21	11	6	46	Distinctly inconsistent.
Estimated Cranial Capacity .	8	21	11	10	50	Nearly consistent.

COMPARISON OF THE CONCLUSIONS DERIVED FROM THE STATISTICAL METHOD WITH
THE RESULTS OBTAINED BY ANALYSIS OF GROUPS.

	The number of specimens in each period to be assigned to the several groups.					Results as they appear in the Curves of Probability.
	Negroid.	Non-Negroid.	Intermediate.	Unclassed.	Total.	
<i>Early Predynastic. Females.</i>						
Cephalic Index	8	18	14	20	60	Most inconsistent of all the curves for this index in females.
Vertical Index	8	17	14	10	49	Consistent.
Upper Facial Index	8	18	15	1	42	Most inconsistent of all the curves for this index in females.
Nasal Index	8	18	15	4	45	Very consistent.
Estimated Cranial Capacity	8	17	14	10	49	Consistent.
<i>Late Predynastic. Females.</i>						
Cephalic Index	24	32	29	49	134	One of the most consistent of the curves for this index in females.
Vertical Index	24	32	29	42	127	The most consistent of all the curves for this index in females.
Upper Facial Index	24	33	29	5	91	Very consistent.
Nasal Index		33	29	26	112	Very consistent, resembling Early Pre- dynastic.
Estimated Cranial Capacity	24	32	29	40	125	Consistent.
<i>First Dynasty. Females.</i>						
Cephalic Index	12	13	19	17	61	Hardly consistent.
Vertical Index	13	13	18	13	57	Nearly consistent.
Upper Facial Index	13	13	19	2	47	Doubtful.
Nasal Index	13	13	19	9	54	Very consistent, just like Late Pre- dynastic.
Estimated Cranial Capacity	12	13	18	13	56	Most inconsistent of all the curves for this index in females.
<i>Sixth to Twelfth Dynasties. Fe- males.</i>						
Cephalic Index	15	51	41	39	146	Fairly consistent.
Vertical Index	15	51	41	39	146	Fairly consistent.
Upper Facial Index	15	52	42	5	114	Fairly consistent.
Nasal Index	15	52	42	24	133	The most consistent of all the curves for this index for females.
Estimated Cranial Capacity	15	51	41	39	146	Very inconsistent.
<i>Twelfth to Fifteenth Dynasties. Hou. Females.</i>						
Cephalic Index	8	24	19	5	56	Fairly consistent.
Vertical Index	8	24	19	5	56	Fairly consistent.
Upper Facial Index	8	24	19	0	51	Fairly consistent.
Nasal Index	8	24	19	4	55	Quite consistent.
Estimated Cranial Capacity	8	24	18	5	55	Consistent.
<i>Twelfth to Fifteenth Dynasty. Abydos. Females.</i>						
Cephalic Index	5	15	11	1	32	Inconsistent.
Vertical Index	5	15	11	1	32	Inconsistent.
Upper Facial Index	5	15	11	0	31	Fairly consistent.
Nasal Index	5	15	11	1	32	Consistent.
Estimated Cranial Capacity	5	15	11	1	32	Very consistent.
<i>Eighteenth Dynasty. Abydos. Females.</i>						
Cephalic Index	12	34	17	4	67	Ambiguous.
Vertical Index	11	34	17	4	66	Consistent.
Upper Facial Index	12	34	17	0	63	Fairly consistent.
Nasal Index	12	34	17	4	67	Very inconsistent.
Estimated Cranial Capacity	11	34	17	4	66	Very consistent.
<i>Eighteenth Dynasty. Shekh Ali. Females.</i>						
Cephalic Index	7	24	15	2	48	Inconsistent.
Vertical Index	7	24	15	2	48	Strikingly inconsistent.
Upper Facial Index	7	24	15	0	46	Fairly inconsistent.
Nasal Index	7	24	15	1	47	Consistent.
Estimated Cranial Capacity	7	23	15	2	47	Consistent.
<i>Ptolemaic Period. Females.</i>						
Cephalic Index	17	24	14	7	62	Hardly consistent.
Vertical Index	17	24	15	5	61	Consistent.
Upper Facial Index	17	24	15	3	59	Probably consistent.
Nasal Index	17	24	15	2	58	Inconsistent.
Estimated Cranial Capacity	17	24	14	6	61	Inconsistent.
<i>Roman Period. Females.</i>						
Cephalic Index	11	18	15	6	50	The least inconsistent of all the curves for this index for females.
Vertical Index	11	18	15	5	49	The most inconsistent of all the curves for this index for females.
Upper Facial Index	11	18	15	1	45	Probably inconsistent.
Nasal Index	11	18	15	5	49	Inconsistent.
Estimated Cranial Capacity	10	18	15	5	48	Consistent.

TABULATIONS REFERRING TO THE OCCURRENCE OF MICROCEPHALY
AND ITS POSSIBLE ASSOCIATION WITH A PYGMY RACE. (See p. 87.)

TABLE XXVI.

MALES OF THE FIRST THREE PERIODS.

MICROCEPHALIC SPECIMENS (i.e. with Capacity
1800 cc. and under).

	Catalogue Number.	Capacity in centimetres.	Femoral length (maximum) in millimetres.
<i>Early Predynastic .</i>	21	1195	393
	1118	1245	475
	1129	1300	461
	1155	1290	448
	1251	1250	479
<i>Late Predynastic .</i>	1121	1220	487
	1149	1295	469
	1161	1260	481
	1165	1300	445
	1183	1280	449
	1189	1300	425
	1191	1310	447
	1195	1220	481
	1233	1280	439
	1239	1240	443
	1295	1260	477
	79	1290	499
<i>First Dynasty . .</i>			

Whereas the general average of Femoral length alike in
the Early Predynastic and in the Late Predynastic Males
is 450 mm.

TABLE XXVII.

SPECIMENS OF UNUSUALLY SMALL STATURE (i.e. with
Femoral length less than 430 mm.).

	Catalogue Number.	Femoral length (maximum) in millimetres.	Capacity in centimetres.
<i>Early Predynastic .</i>	5	412	1430
	9	(not measur- able, but small)	1120
	21	393	1195
	27	422	1325
	1153	425	1320
<i>Late Predynastic .</i>	1187	408	1310
	115	425	1350
	1123	426	1320
	1145	402	1400
	1168	428	1470
	1171	422	1390
	1189	425	1300
	1197	409	1400
<i>First Dynasty . .</i>		none available	

Whereas the general average of Capacity for the Early Predynastic
Males is 1374 cc. and for the Late Predynastic Males 1394 cc.

TABLE XXVIII.

FEMALES OF THE FIRST THREE PERIODS.

MICROCEPHALIC SPECIMENS (i.e. with a Capacity
of 1140 cc. and under).

	Catalogue Number.	Capacity in centimetres.	Femoral length (maximum) in millimetres.
<i>Early Predynastic .</i>	10	1140	429
	1166	1115	440
	1172	1140	441
	1254	1065	436
<i>Late Predynastic .</i>	1114	1180	420
	1192	1145	377
	1194	1145	415
	1198	1100	418
	1210	1120	434
	1220	1120	426
	1228	1130	386
	1260	1120	439
<i>First Dynasty . .</i>		none available	

Whereas the general average of Femoral length in the
Early Predynastic Females is 435 mm. and of the Late Pre-
dynastic Females 425 mm.

TABLE XXIX.

SPECIMENS OF UNUSUALLY SMALL STATURE (i.e. with
Femoral length of 390 mm. and under).

	Catalogue Number.	Femoral length (maximum) in millimetres.	Capacity in centimetres.
<i>Early Predynastic .</i>		none available	
<i>Late Predynastic .</i>	134	391	1220
	1192	377	1145
	1228	386	1130
<i>First Dynasty . .</i>	72	351	1190

CATALOGUE NUMBERS OF SPECIMENS AS ASSIGNED TO GROUPS 135

If the limits are extended, so as to include Males combining a cranial capacity of under 1370 cc., with a femur of under 430 mm., and Females combining a capacity of under 1250 cc., with a femur of under 410 mm., there will be twenty specimens in these first three periods of which it may be said that they have at once a small capacity and small stature. These specimens are—

Early Predynastic . Males, nos. 9, 1153, 1187.
Females, no. 1144.

Late Predynastic . . Males, nos. 115, 1123, 1171, 1189.
Females, nos. 134, 1156, 1192, 1222, 1228, 1264, 1268, 1286, 1294.

First Dynasty . . . Females, nos. 72, 1252, 1282.

The reader will see on reference to the supplement (Charts I and II) that these specimens exhibit all varieties of Facial and Nasal index.

We have similarly examined the sixth to twelfth dynasties series, and have found the results even less favourable to the hypothesis of the presence of pygmies. Those who wish to examine the question, may compare the capacities given in the Appendix of the present volume, with the femoral lengths published in *Denderah*, Plates N and O, where the catalogue numbers used correspond to those employed in this volume.

The only other period for which we have data is that of the twelfth to fifteenth dynasties from Hou. In the following list we give the catalogue numbers of these specimens, which have unusually short femora, and the reader may compare them with the tables of capacity, &c., published in Charts I and II G:—

Males (430 mm., or under), nos. 5, 9, 11, 13, 27, 29, 31, 61, 69, 73, 91.

Females (390 mm., or under), nos. 10, 40, 52, 58, 68, 78, 98.

TABLE XXX.

CATALOGUE NUMBERS OF THE SPECIMENS ASSIGNED TO THE TWO DIFFERENT GROUPS AND OF THOSE WHICH ARE INTERMEDIATE BETWEEN THE TWO GROUPS.

	<i>Group I (Negroia).</i>	<i>Group II (Non-Negroid).</i>	<i>Intermediate.</i>
<i>Early Predynastic.</i>			
Males (Chart I A) . .	7, 9, 1035, 1090, 1103, 1155, 1187, 1251.	1, 3, 5, 11, 25, 35, 1005, 1069, 1075, 1113, 1143, 1163, 1159, 1203, 1211, 1247.	29, 33, 131, 139, 1017, 1057, 1059, 1095, 1129.
Females (Chart II A) .	26, 1010, 1020, 1054, 1082, 1118, 1166, 1254.	2, 4, 10, 18, 22, 24, 28, 30, 32, 46, 302, 1026, 1126, 1144, 1146, 1154, 1172, 1244.	6, 8, 14, 20, 40, 50, 54, 1058, 1066, 1078, 1088, 1148, 1164, 1170, 1202.
<i>Late Predynastic.</i>			
Males (Chart I B) . .	125, 155, 211, 1019, 1027, 1045, 1079, 1147, 1151, 1161, 1165, 1177, 1193, 1195, 1199, 1217, 1237, 1239, 1249, 1257.	167, 175, 213, 313, 1001, 1003, 1009, 1013, 1015, 1021, 1023, 1031, 1043, 1051, 1055, 1077, 1081, 1083, 1087, 1089, 1097, 1111, 1145, 1167, 1175, 1183, 1185, 1189, 1191, 1207, 1215, 1223, 1245, 1253, 1255, 1261.	115, 141, 255, 311, 1007, 1037, 1047, 1063, 1065, 1067, 1073, 1085, 1093, 1117, 1123, 1163, 1171, 1173, 1201, 1227, 1241, 1243, 1281, 1291, 1295.
Females (Chart II B) .	164, 320, 324, 1006, 1012, 1028, 1032, 1070, 1100, 1106, 1114, 1124, 1136, 1138, 1174, 1180, 1184, 1196, 1210, 1218, 1230, 1236, 1250, 1262.	104, 112, 322, 1003, 1016, 1022, 1034, 1038, 1050, 1060, 1062, 1102, 1112, 1122, 1132, 1142, 1152, 1162, 1168, 1176, 1182, 1186, 1204, 1206, 1208, 1216, 1220, 1222, 1228, 1232, 1246, 1258, 1280.	134, 138, 150, 170, 314, 1004, 1014, 1030, 1046, 1048, 1074, 1076, 1092, 1094, 1098, 1120, 1128, 1140, 1178, 1190, 1194, 1224, 1234, 1248, 1264, 1276, 1286, 1294, 1296.
<i>First Dynasty.</i>			
Males (Chart I C) . .	63, 67, 529, 1213, 1219, 1225.	69, 71, 83, 517, 527, 1231, 1279, 1283, 1287, 1289.	511, 523, 525, 1157, 1221, 1275.
Females (Chart II C) .	62, 96, 514, 520, 522, 526, 534, 542, 544, 1238, 1266, 1288, 1292.	64, 70, 76, 80, 88, 90, 94, 98, 502, 510, 518, 538, 540	58, 60, 66, 72, 82, 100, 102, 506, 512, 524, 528, 532, 536, 1240, 1242, 1252, 1274, 1282, 1290.

TABLE XXX (continued).

CATALOGUE NUMBERS OF THE SPECIMENS ASSIGNED TO THE TWO GROUPS AND TO THE INTERMEDIATES.

	<i>Group I (Negroid).</i>	<i>Group II (Non-Negroid).</i>	<i>Intermediate.</i>
<i>Royal Tombs.</i>			
Males (Chart I D) . .	421.	405, 406, 408, 414, 418, 419, 425, 430, 457, 459, 474.	415, 476, 477.
Females (Chart II D) .	411, 478.	404, 416, 423, 426, 460.	428, 432, 440.
<i>Sixth to Twelfth Dynasties.</i>			
Males (Chart I F) . .	7, 15, 21, 28, 33, 60, 67, 82, 83, 109, 121, 126, 131, 135, 147, 154, 182, 185, 187, 203, 206, 214, 220, 257, 270, 282, 289, 292, 312, 315, 327.	1, 13, 20, 26, 27, 29, 31, 40, 51, 53, 55, 57, 61, 64, 76, 77, 79, 80, 81, 89, 97, 100, 105, 113, 114, 117, 119, 122, 130, 132, 137, 142 A, 146 A, 146 B, 152, 163, 165, 170, 175, 176, 177, 180, 183, 184, 188, 190, 193, 196, 200, 204, 209, 217 A, 219, 229, 231, 233, 243, 244, 245, 246, 255, 259, 261, 262, 266, 268, 272, 274, 276, 278, 281, 286, 288, 291, 302, 317, 320, 323, 325, 330, 332.	6, 25, 30, 32, 69, 71, 84, 106, 127, 133, 133, 142 B, 150, 156, 159, 160, 212, 215, 224, 240, 247, 248, 252, 253, 254, 258, 265, 279, 283, 285, 298, 301, 304, 308, 311, 319, 324.
Females (Chart II F) .	3, 8, 14, 37, 52, 78, 88, 93, 124, 192, 207, 227, 237, 275, 314.	9, 10, 11, 16, 17, 23, 45, 48, 53, 62, 65, 68, 73, 86, 87, 97, 104, 111, 116, 118, 125, 140, 145, 148, 149, 151, 153, 157, 161, 162, 169, 181, 193, 201, 202, 205, 213, 216, 217, 225, 232, 238, 241, 250, 263, 264, 269, 271, 277, 296, 322, 334.	2, 4, 5, 24, 36, 44, 54, 59, 72, 75, 90, 91, 93, 98, 102, 120, 123, 144, 158, 164, 167, 178, 179, 186, 189, 191, 197, 218, 235, 236, 239, 242, 249, 256, 260, 267, 273, 287, 290, 299, 310, 333.
<i>Twelfth to Fifteenth Dynasties from Hou.</i>			
Males (Chart I G) . .	17, 37, 45, 47, 55, 95, 97, 105, 107, 111.	1, 3, 5, 7, 9, 11, 13, 19, 25, 29, 31, 33, 39, 51, 57, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 85, 87, 89, 91, 93, 99.	15, 21, 23, 35, 43, 49, 53, 59, 61.
Females (Chart II G) .	4, 34, 70, 72, 92, 96, 98, 104.	2, 6, 8, 10, 12, 16, 18, 22, 28, 32, 33, 40, 43, 54, 56, 62, 64, 66, 74, 80, 86, 88, 90, 94.	14, 20, 26, 30, 36, 42, 44, 46, 52, 58, 60, 63, 76, 78, 82, 84, 100, 106, 110.
<i>Twelfth to Fifteenth Dynasties from Abydos.</i>			
Males (Chart I H) . .	none.	119, 121, 123, 125, 127, 129, 133, 135, 139.	131, 137.
Females (Chart II H) .	132, 154, 158, 164, 172.	126, 134, 136, 138, 140, 142, 146, 148, 150, 166, 170, 174, 180, 184, 186.	124, 128, 130, 144, 152, 156, 160, 162, 176, 178, 182.
<i>Eighteenth Dynasty from Abydos.</i>			
Males (Chart I J) . .	13, 37, 45, 57, 77, 79, 81, 99.	1, 3, 5, 7, 9, 11, 15, 17, 23, 25, 27, 29, 33, 39, 41, 43, 51, 53, 55, 61, 63, 65, 71, 73, 75, 83, 85, 87, 93, 95, 97.	19, 21, 31, 35, 47, 59, 67, 69, 89, 91.
Females (Chart II J) .	6, 32, 34, 52, 56, 66, 86, 88, 102, 104, 126, 132.	2, 4, 10, 16, 18, 20, 22, 26, 36, 46, 48, 60, 64, 68, 70, 72, 74, 78, 80, 82, 90, 92, 94, 100, 106, 108, 110, 112, 114, 116, 120, 122, 124, 128.	8, 28, 30, 38, 40, 42, 44, 50, 54, 58, 62, 76, 96, 98, 118, 130, 134.
<i>Eighteenth Dynasty from Shekh Ali.</i>			
Males (Chart I K) . .	19, 21, 33, 35, 51, 71, 75, 81.	5, 7, 11, 15, 17, 23, 27, 29, 31, 37, 39, 41, 43, 45, 47, 49, 55, 57, 59, 61, 65, 79.	9, 13, 63, 67, 69, 73, 77.
Females (Chart II K) .	8, 18, 30 B, 32, 34, 52, 62.	2, 4, 10, 12, 16, 20, 24, 30 A, 36, 38, 42, 44, 46, 48, 50, 56, 64, 68, 74, 80, 84, 86, 88, 94.	6, 14, 22, 28, 40, 54, 58, 60, 66, 70, 72, 76, 78, 82, 90.
<i>Thirtieth Dynasty from Shekh Ali.</i>			
Males (Chart II L) . .	11, 15, 27.	3, 5, 7, 9, 21, 25, 29, 31.	1, 13, 17, 19, 23.
Females (Chart II L) .	4, 8, 18.	2, 10, 12, 24, 30, 32.	6, 14, 16, 20, 26, 28.

TABLE XXX. CATALOGUE NUMBERS OF THE SPECIMENS (*continued*).

	Group I (Negroid).	Group II (Non-Negroid).	Intermediate.
<i>Ptolemaic Period.</i>			
Males (Chart I M) . .	348, 379, 392, 407, 409, 416, 430, 450, 452, 474.	336, 338, 344, 353, 356, 365, 367, 368, 371, 376, 377, 381, 383, 385, 391, 397, 398, 403, 404, 405, 417, 427, 429, 437, 442, 444, 448, 457, 458, 463, 464, 465, 466, 472, 475.	335, 350, 354, 359, 360, 361, 364, 366, 370, 386, 390, 395, 411, 412, 414, 420, 422, 431, 433, 440, 441, 453, 454, 460, 462, 471, 473.
Females (Chart II M) .	337, 339, 343, 358, 373, 393, 394, 401, 410, 415, 418, 426, 438, 443, 446, 461, 470.	340, 345, 346, 347, 349, 352, 375, 378, 380, 384, 387, 388, 389, 396, 400, 406, 413, 424, 428, 435, 436, 445, 451, 456.	342, 362, 372, 382, 402, 408, 423, 425, 434, 439, 447, 449, 459, 467, 476.
<i>Roman Period.</i>			
Males (Chart I N) . .	487, 496, 509, 512, 516, 542, 547, 564.	480, 486, 495, 501, 502, 505, 506, 508, 515, 521, 522, 532, 540, 544, 548, 555, 556, 567, 569, 570, 572.	477, 479, 489, 503, 511, 527, 560, 562, 573, 574, 578.
Females (Chart II N) .	494, 498, 499, 513, 523, 525, 526, 537, 539, 552, 565.	482, 483, 484, 490, 492, 500, 504, 507, 510, 514, 518, 524, 535, 551, 561, 568, 571, 577.	481, 485, 491, 493, 519, 528, 529, 534, 536, 538, 558, 559, 566, 575, 576.

MATHEMATICAL PROPERTIES OF PROBABILITY CURVES FOR COMBINED PERIODS.

Those who are interested in the attempts to treat such series as those here presented by statistical methods may wish to experiment with the Frequency Curves and Probability Curves obtainable from a combination of the specimens of more than one period. We cannot afford the space to reproduce such curves, but, to save labour to those who care to compile them from the charts, we publish the mathematical properties of the Probability Curves of three such combinations, as well as of Curves composed of the entire Upper Egyptian collection. They are as follows:—

Period up to the time of the Pyramid Builders, i.e. Early and Late Predynastic, First Dynasty, Royal Tombs, and Third and Fourth Dynasties from Regagah.

MALES.

Upper Facial Index. n being 163.
 $M \pm R = 55.61 \pm .14$. $\eta = 2.16$. $r = 1.83$.
 $c = 3.82$. $\frac{A}{c\sqrt{\pi}} = 24.0$. Misfit 35%.
 Half examples between 53.78 and 57.44.
 Nasal Index. n being 198.
 $M \pm R = 50.31 \pm .21$. $\eta = 3.54$. $r = 2.99$.
 $c = 6.28$. $\frac{A}{c\sqrt{\pi}} = 17.8$. Misfit 17%.
 Half examples between 47.32 and 53.30.
 Cephalic Index. n being 256.
 $M \pm R = 72.60 \pm .15$. $\eta = 2.67$. $r = 2.25$.
 $c = 4.73$. $\frac{A}{c\sqrt{\pi}} = 28.3$. Misfit 14%.
 Half examples between 70.35 and 74.85.
 Estimated Cranial Capacity. n being 212.
 $M \pm R = 1406 \pm 5.2$. $\eta = 89.1$. $r = 75.3$.
 $c = 137.9$. $\frac{A}{c\sqrt{\pi}} = 15.19$. Misfit 23%.
 Half examples between 1330.7 and 1481.3.
 Vertical Index. n being 216.
 $M \pm R = 72.44 \pm .13$. $\eta = 2.25$. $r = 1.90$.
 $c = 3.99$. $\frac{A}{c\sqrt{\pi}} = 30.53$. Misfit 19%.
 Half examples between 70.54 and 74.34.

FEMALES.

Upper Facial Index. n being 192.
 $M \pm R = 55.46 \pm .16$. $\eta = 2.55$. $r = 2.15$.
 $c = 4.52$. $\frac{A}{c\sqrt{\pi}} = 23.96$. Misfit 22%.
 Half examples between 53.31 and 57.61.
 Nasal Index. n being 229.
 $M \pm R = 51.40 \pm .20$. $\eta = 3.54$. $r = 2.99$.
 $c = 6.27$. $\frac{A}{c\sqrt{\pi}} = 20.62$. Misfit 22%.
 Half examples between 48.41 and 54.39.
 Cephalic Index. n being 276.
 $M \pm R = 73.40 \pm .12$. $\eta = 2.45$. $r = 2.07$.
 $c = 4.34$. $\frac{A}{c\sqrt{\pi}} = 35.84$. Misfit 16%.
 Half examples between 71.33 and 75.47.
 Estimated Cranial Capacity. n being 245.
 $M \pm R = 1269.4 \pm 4.2$. $\eta = 76.1$. $r = 64.4$.
 $c = 135.0$. $\frac{A}{c\sqrt{\pi}} = 19.57$. Misfit 28%.
 Half examples between 1205.4 and 1333.8.
 Vertical Index. n being 249.
 $M \pm R = 72.57 \pm .12$. $\eta = 2.08$. $r = 1.76$.
 $c = 3.68$. $\frac{A}{c\sqrt{\pi}} = 38.11$. Misfit 16%.
 Half examples between 70.81 and 74.33.

MATHEMATICAL PROPERTIES OF PROBABILITY CURVES FOR COMBINED PERIODS (*continued*).

Middle and New Empire, i.e. Sixth to Twelfth Dynasties, Twelfth to Fifteenth from Abydos and Hou, Eighteenth from Abydos and Shekh Ali, Thirtieth Dynasty.

MALES.

Upper Facial Index. n being 321.
 $M \pm R = 56.20 \pm .11$. $\eta = 2.27$. $r = 1.92$.
 $c = 4.02$. $\frac{A}{c\sqrt{\pi}} = 44.93$. Misfit 20%.
 Half examples between 54.28 and 58.12.
 Nasal Index. n being 335.
 $M \pm R = 49.50 \pm .19$. $\eta = 3.40$. $r = 2.87$.
 $c = 6.02$. $\frac{A}{c\sqrt{\pi}} = 31.30$. Misfit 19%.
 Half examples between 46.63 and 52.37.
 Cephalic Index. n being 345.
 $M \pm R = 73.64 \pm .12$. $\eta = 2.86$. $r = 2.31$.
 $c = 5.08$. $\frac{A}{c\sqrt{\pi}} = 38.00$. Misfit 15%.
 Half examples between 71.33 and 75.95.
 Estimated Cranial Capacity. n being 342.
 $M \pm R = 1401.6 \pm 5.3$. $\eta = 94.3$. $r = 79.7$.
 $c = 167.2$. $\frac{A}{c\sqrt{\pi}} = 23.08$. Misfit 44%.
 Half examples between 1321.9 and 1481.3.
 Vertical Index. n being 343.
 $M \pm R = 73.21 \pm .11$. $\eta = 2.37$. $r = 2.00$.
 $c = 4.20$. $\frac{A}{c\sqrt{\pi}} = 48.96$. Misfit 17%.
 Half examples between 71.21 and 75.21.

FEMALES.

Upper Facial Index. n being 321.
 $M \pm R = 56.26 \pm .11$. $\eta = 2.25$. $r = 1.91$.
 $c = 4.00$. $\frac{A}{c\sqrt{\pi}} = 45.25$. Misfit 13%.
 Half examples between 54.35 and 58.17.
 Nasal Index. n being 350.
 $M \pm R = 50.99 \pm .16$. $\eta = 3.56$. $r = 3.01$.
 $c = 6.32$. $\frac{A}{c\sqrt{\pi}} = 31.26$. Misfit 27%.
 Half examples between 47.98 and 54.00.
 Cephalic Index. n being 365.
 $M \pm R = 74.97 \pm .11$. $\eta = 2.47$. $r = 2.09$.
 $c = 4.37$. $\frac{A}{c\sqrt{\pi}} = 47.05$. Misfit 19%.
 Half examples between 72.88 and 77.06.
 Estimated Cranial Capacity. n being 362.
 $M \pm R = 1261.6 \pm 3.4$. $\eta = 75.7$. $r = 63.9$.
 $c = 124.1$. $\frac{A}{c\sqrt{\pi}} = 29.77$. Misfit 18%.
 Half examples between 1197.7 and 1325.5.
 Vertical Index. n being 364.
 $M \pm R = 73.21 \pm .11$. $\eta = 2.37$. $r = 2.00$.
 $c = 4.20$. $\frac{A}{c\sqrt{\pi}} = 48.85$. Misfit 14%.
 Half examples between 71.21 and 75.21.

Period of Foreign Domination, i.e. Ptolemaic and Roman Periods.

MALES.

Upper Facial Index. n being 119.
 $M \pm R = 55.28 \pm .22$. $\eta = 2.80$. $r = 2.37$.
 $c = 4.96$. $\frac{A}{c\sqrt{\pi}} = 13.52$. Misfit 27%.
 Half examples between 52.91 and 57.65.
 Nasal Index. n being 123.
 $M \pm R = 49.23 \pm .24$. $\eta = 3.10$. $r = 2.62$.
 $c = 5.49$. $\frac{A}{c\sqrt{\pi}} = 12.64$. Misfit 36%.
 Half examples between 46.61 and 51.85.
 Cephalic Index. n being 128.
 $M \pm R = 74.39 \pm .21$. $\eta = 2.92$. $r = 2.41$.
 $c = 5.18$. $\frac{A}{c\sqrt{\pi}} = 14.00$. Misfit 35%.
 Half examples between 71.98 and 76.80.
 Estimated Cranial Capacity. n being 124.
 $M \pm R = 1381.8 \pm 5.6$. $\eta = 73.7$. $r = 62.3$.
 $c = 130.7$. $\frac{A}{c\sqrt{\pi}} = 10.71$. Misfit 38%.
 Half examples between 1319.5 and 1444.1.
 Vertical Index. n being 125.
 $M \pm R = 71.89 \pm .17$. $\eta = 2.29$. $r = 1.94$.
 $c = 4.06$. $\frac{A}{c\sqrt{\pi}} = 17.38$. Misfit 23%.
 Half examples between 69.95 and 73.83.

FEMALES.

Upper Facial Index. n being 104.
 $M \pm R = 54.97 \pm .20$. $\eta = 2.46$. $r = 2.08$.
 $c = 4.36$. $\frac{A}{c\sqrt{\pi}} = 13.47$. Misfit 25%.
 Half examples between 52.89 and 57.05.
 Nasal Index. n being 107.
 $M \pm R = 50.70 \pm .34$. $\eta = 4.13$. $r = 3.47$.
 $c = 7.31$. $\frac{A}{c\sqrt{\pi}} = 8.26$. Misfit 37%.
 Half examples between 47.23 and 54.17.
 Cephalic Index. n being 112.
 $M \pm R = 75.71 \pm .21$. $\eta = 2.62$. $r = 2.21$.
 $c = 4.64$. $\frac{A}{c\sqrt{\pi}} = 13.61$. Misfit 35%.
 Half examples between 73.50 and 77.92.
 Estimated Cranial Capacity. n being 109.
 $M \pm R = 1243.6 \pm 6.1$. $\eta = 76.3$. $r = 63.6$.
 $c = 135.3$. $\frac{A}{c\sqrt{\pi}} = 9.09$. Misfit 40%.
 Half examples between 1180.0 and 1307.2.
 Vertical Index. n being 110.
 $M \pm R = 72.28 \pm .18$. $\eta = 2.20$. $r = 1.86$.
 $c = 3.90$. $\frac{A}{c\sqrt{\pi}} = 15.91$. Misfit 21%.
 Half examples between 70.42 and 74.14.

MATHEMATICAL PROPERTIES OF PROBABILITY CURVES FOR COMBINED PERIODS (*continued*).*All Periods except Medum and Deshasheh.*

MALES.

Upper Facial Index. n being 603.

$$M \pm R = 55.62 \pm .10. \quad \eta = 2.81. \quad r = 2.38.$$

$$c = 4.99. \quad \frac{A}{c\sqrt{\pi}} = 71.44. \quad \text{Misfit } 19\%.$$

Half examples between 53.24 and 58.00.

Nasal Index. n being 656.

$$M \pm R = 49.70 \pm .11. \quad \eta = 3.14. \quad r = 2.91.$$

$$c = 6.10. \quad \frac{A}{c\sqrt{\pi}} = 60.63. \quad \text{Misfit } 13\%.$$

Half examples between 46.79 and 52.61.

Cephalic Index. n being 729.

$$M \pm R = 73.36 \pm .08. \quad \eta = 2.59. \quad r = 2.19.$$

$$c = 4.59. \quad \frac{A}{c\sqrt{\pi}} = 89.71. \quad \text{Misfit } 12\%.$$

Half examples between 71.17 and 75.55.

Estimated Cranial Capacity. n being 678.

$$M \pm R = 1400.8 \pm 2.8. \quad \eta = 87.3. \quad r = 73.8.$$

$$c = 154.7. \quad \frac{A}{c\sqrt{\pi}} = 49.88. \quad \text{Misfit } 16\%.$$

Half examples between 1327.0 and 1474.6.

Vertical Index. n being 684.

$$M \pm R = 72.75 \pm .08. \quad \eta = 2.40. \quad r = 2.03.$$

$$c = 4.25. \quad \frac{A}{c\sqrt{\pi}} = 90.75. \quad \text{Misfit } 11\%.$$

Half examples between 70.72 and 74.78.

FEMALES.

Upper Facial Index. n being 617.

$$M \pm R = 55.78 \pm .08. \quad \eta = 2.41. \quad r = 2.03.$$

$$c = 4.27. \quad \frac{A}{c\sqrt{\pi}} = 81.53. \quad \text{Misfit } 11\%.$$

Half examples between 53.75 and 57.81.

Nasal Index. n being 686.

$$M \pm R = 51.09 \pm .11. \quad \eta = 3.49. \quad r = 2.95.$$

$$c = 6.18. \quad \frac{A}{c\sqrt{\pi}} = 62.63. \quad \text{Misfit } 16\%.$$

Half examples between 48.14 and 54.04.

Cephalic Index. n being 753.

$$M \pm R = 74.52 \pm .08. \quad \eta = 2.56. \quad r = 2.17.$$

$$c = 4.54. \quad \frac{A}{c\sqrt{\pi}} = 93.44. \quad \text{Misfit } 13\%.$$

Half examples between 72.35 and 76.69.

Estimated Cranial Capacity. n being 716.

$$M \pm R = 1261.2 \pm 2.4. \quad \eta = 77.1. \quad r = 63.5.$$

$$c = 133.2. \quad \frac{A}{c\sqrt{\pi}} = 60.67. \quad \text{Misfit } 13\%.$$

Half examples between 1197.7 and 1324.7.

Vertical Index. n being 723.

$$M \pm R = 72.85 \pm .07. \quad \eta = 2.25. \quad r = 1.90.$$

$$c = 3.99. \quad \frac{A}{c\sqrt{\pi}} = 102.15. \quad \text{Misfit } 11\%.$$

Half examples between 70.95 and 74.75.

An erratum-slip to accompany Chart I.

In Chart I F, Fig. 2 (Males of 'sixth to twelfth dynasties, vertical index), the arithmetical mean should be quoted as 73.98. Consequently the Curve of Probability should be drawn one unit to the left of its present place, and the misfit be stated as 20 per cent.

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ABSOLUTE MEASUREMENTS OF EGYPTIAN SKULLS

From HOU	Glabello-Occipital Length	Optico-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Brainbreadth	Biygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Angle	Prognathism or Orthognathism	Estimated Canine Capacity
Specimen No. 1103	186	185	135	135	115	125	105	103	66	47	98	73	D	1440
1113	178	175	124	184	110	128	96	93	74	53	97	69	A B	1245
1125	187	186	134	128			110	103	67	50	94	77	B C	1360
1138	181	181	130	130	117	129	108	104	69	49	101	69 ¹	D E	1800
1143	185	182	135	138	121	136	104	100	78	55	96	70	A B	1470
1153	184	184	132	128	106	117	97	93	72	53	96	70	A B	1320
1155	184	184	129	127	116	131	102	106	63	48	104	68 ¹	F	1290
1159	185	183	136	131	117	129	111	114	73	54	103	68 ¹	D E	1400
1187	180	179	138	124	114	120	101	101	62	46	100	71	E F	1310
1203	181	180	139	131	113	121	98	92	71	53	94	73	A	1400
1211	183	182	138	131	111	126	102	98	73	49	96	71	B	1410
1247	183	180	140	137	127	138	103	103	74	52	100	69	C	1493
1251	184	184	125	128	112	121	98	95	64	44	102 ¹	72 ¹	C	1250

[illegible]

OF EGYPTIAN SKULLS
(IN MILLIMETRES)

(IN MILLIMETRES)

From ABYDOS		Clabell	Opheo- Length	Opheo- Occipital	Bas- Height	Maximum Breadth	Breathur Breadth	Biizygomatic Breadth	Bas- Nasal	Bas- Alveolar Length	Nas- Alveolar Height	Nasal Height	Nasal Width	Flowers Alveolar Index	Gnathic Angle	Prognathism or Ortho- gnathism	Estimated Cranial Capacity
Specimen No.																	
1 S	178	177	138	131	113	120	98	89	68	49	23	93	91	76	A	1370	
8 S	179	179	131	125	111	121	97	92	67	48	23	93	95	73	B	1350	
7 S	186	185	134	136	112	116	—	—	—	—	—	—	—	—	—	—	
7 S	183	180	132	131	112	122	103	99	64	50	26	96	96	74	C	1430	
8 S	169	169	132	119	106	119	100	96	64	44	25	96	96	74	BC	1130	
11 S	202	202	143	136	119	130	107	100	75	54	24	93	93	73	A	1670	
13 S	135	135	—	114	—	—	—	—	—	—	—	—	—	—	—	—	
15 S	175	175	—	128	—	—	—	—	—	—	—	—	—	—	—	—	
17 S	190	190	—	146	—	—	—	—	—	—	—	—	—	—	—	—	
19 S	188	188	—	127	—	—	—	—	—	—	—	—	—	—	—	—	
21 S	177	177	122	130	—	—	—	—	—	—	—	—	—	—	—	1195	
23 S	192	189	137	136	114	123	96	89	76	56	25	93	93	70	A	1500	
25 S	187	187	137	138	114	123	96	89	76	56	25	93	93	70	A	1500	
27 S	176	174	134	132	100	123	98	86	65	—	—	—	88	79	—	1325	
29 S	192	192	130	139	116	125	103	108	72	48	28	105	105	66	EF	1480	
31 S	187	187	—	132	—	—	—	—	—	—	—	—	—	—	—	—	
33 S	187	185	136	125	105	119	101	93	66	48	25	92	92	76	A	1350	
35 S	181	177	134	131	112	125	102	102	76	51	25	100	100	68	C	1350	
37 S	194	191	134	134	127	—	109	99	72	51	26	91	91	77	A	1480	
39 S	191	189	—	130	—	—	—	—	—	—	—	—	—	—	—	—	
From EL AMRAH																	
123 S	161	161	—	129	—	123	106	95	65	50	24	90	90	80	A	1370	
131 S	181	180	138	129	—	113	—	—	67	47	26	—	—	—	—	1490	
139	183	183	138	135	—	—	—	—	—	—	—	—	—	—	—	—	
169 S	169	169	—	140	—	—	—	—	—	—	—	—	—	—	—	—	
199 S	189	188	—	138	—	—	—	—	—	—	—	—	—	—	—	—	
207	189	189	—	125	—	—	—	—	—	—	—	—	—	—	—	—	
217	182	184	—	128	—	—	—	—	—	—	—	—	—	—	—	—	
219	195	193	—	125	—	—	—	—	—	—	—	—	—	—	—	—	
301	193	191	140	131	—	123	—	—	—	—	—	—	—	—	—	—	
303	190	188	—	125	—	—	—	—	—	—	—	—	—	—	—	1495	
From HOU																	
1005	177	176	121	134	116	125	96	95	72	53	25	99	99	68	BC	1290	
1017	189	188	129	126	111	126	105	109	68	51	26	104	104	71	E	1305	
1025	190	188	142	133	114	—	106	107	64	—	—	101	101	68	F	1305	
1035	180	179	136	132	121	129	102	100	66	50	27	98	98	72	CD	1375	
1057	181	179	140	141	114	122	102	100	72	51	27	98	98	70	C	1520	
1059	174	171	134	131	116	130	99	97	69	54	22	98	98	71	C	1300	
1069	178	178	137	135	112	122	109	103	74	50	24	94	94	74	AB	1400	
1075	176	173	133	132	111	126	98	93	72	53	25	95	95	71	AB	1315	
1091	181	179	136	139	116	—	98	96	70	50	27	98	98	70	?	1460	
1095	185	183	131	132	111	124	104	101	68	49	26	97	97	75	C	1360	
1099	184	184	133	126	114	125	103	102	66	51	28	99	99	72	D	1310	

From EL AMRAH

161	161	—	129	—	—	106	95	65	50	24	90	80	A	—	1370
181	180	138	129	—	—	113	—	67	47	26	—	—	—	—	1490
188	188	138?	—	—	—	—	—	—	—	—	—	—	—	—	—
169 ²	—	—	140	—	—	—	—	—	—	—	—	—	—	—	—
189	188	—	138	—	—	—	—	—	—	—	—	—	—	—	—
189	189	—	125	—	—	—	—	—	—	—	—	—	—	—	—
182	184	—	128	—	—	—	—	—	—	—	—	—	—	—	—
195	193	—	—	—	—	—	—	—	—	—	—	—	—	—	—
193	191	140 ¹	131	—	—	128	—	—	—	—	—	—	—	—	1495
190	188	—	125	—	—	—	—	—	—	—	—	—	—	—	—
177	176	121	134	116	125	96	95	72	53	25	99	68	B	C	1290
189	188	129	126	111	126	105	107	64	51	26	104	68	F	E	1305
180	183	142	133	114	—	106	107	68	—	—	101	71	C	D	1355
180	179	136	132	121	129	102	100	66	50	27	98	72	E	F	1375
181	179	140	141	114	125	102	100	72	51	27	98	70	C	C	1520
174	171	134	131	116	130	99	97	69	54	22	98	71	C	C	1800
178	178	137	135	112	122	99	103	74	50	24	94 ¹	74	A	B	1400
176	173	133	132	112	126	98	93	72	53	25	95	71 ¹	A	B	1315
181	179	136	139	116	—	98	96	70?	50	27	98	70?	A	B	1460
185	183	131	132	111	124	104	101	68	49	26	97	78	C	C	1360
184	184	133	126	114	125	103	103	66	51	28	99	72	D	D	1310

From HOV

177	176	121	134	116	125	96	95	72	53	25	99	68	B	C	1250
189	188	129	126	111	126	105	107	64	51	26	104	63	F	E	1305
180	180	188	142	133	114	106	107	64	51	26	104	63	F	E	1525
180	179	179	156	132	121	129	102	100	66	50	27	98	72	D	1875
181	179	140	141	114	125	102	102	102	66	50	27	98	72	D	1875
174	171	134	131	116	130	99	97	72	51	27	98	70	C	1520	
178	178	137	135	112	122	109	103	74	50	24	94½	74	A	B	1800
176	173	133	132	112	126	98	93	72	53	25	95	71½	A	B	1400
181	179	156	139	116	126	98	96	70?	50	27	98	70	7	C	1315
185	183	131	132	111	124	104	101	68	49	26	97	73	7	C	1460
184	184	133	126	114	125	103	102	66	51	28	99	72	D	1310	

[I]

[2]

MALES
Late Predynastic

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

MALES
Late Predynastic

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

Specimen No.	From HOU	Glabella-Occipital Length	Occipital Length	Basal-Bregmatic Height	Basal-Bregmatic Length	Basal-Nasal Length	Basal-Nasal Length	Nasal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
1021	—	183	182	129	138	116	126	105	107	78	103	68	E F	1385
1023	—	181	179	131	123	101	101	101	74	51	100	68	C	1240
1027	—	182	180	129	135	102	105	105	67	25	103	68	E F	1300
1029	—	182	179	—	132	—	—	—	—	48	24	—	—	—
1031	—	181	179	130	134	117	127	99	70	54	20	74	F G	1340
1033	—	182	181	136	137	118	124	106	69	49	24	107	F G	1440
1037	—	183	183	131	126	115	124	103	70	48	27	97	B C	1285
1039	—	189	187	136	135	119	—	107	67	52	25	91	A	1475
1041	—	196	193	—	134	—	—	—	—	—	—	—	—	—
1043	—	185	184	126	129	113	125	94	91	50	25	97	B	1280
1045	—	193	192	139	134	119	131	103	69	49	29	98	C D	1580
1047	—	179	177	134	131	119	134	99	74	53	27	91	A	1340
1049	—	188	187	—	131	116	125	—	—	49	27	—	—	—
1051	—	173	172	130	132	111	121	100	69	50	21	104	E	1260
1053	—	188	187	129	135	115	129	—	—	52	23	94	A	1390
1055	—	185	182	132	130	116	128	99	77	51	29	—	A	1350
1061	—	183	179?	—	134	—	—	—	—	51	29	—	—	—
1063	—	178	175	132	135	121	135	102	68	54	26	96	B C	1350
1065	—	181	181	128	130	118	124	101	72	51	27	100	C	1280
1067	—	185	182	129	132	114	122	101	71	58	30	96	B	1300
1071	—	185	183	129	135	123	135	102	66	49	27	95	B C	1370
1073	—	199	196	135	138	123	135	104	66	49	25	102	D E	1580
1077	—	191	190	137	135	116	127	105	70	54	26	95	A	1500
1079	—	185	184	140	133	117	133	109	72	53	28	94	A B	1465
1081	—	179	176	128	131	118	131	99	77	51	25	95	B	1280
1083	—	187	185	130	131	119	128	103	73	54	23	90	A	1350
1085	—	173	173	122	130	101	114	95	66	47	28	101	D E	1170
1087	—	182	180	130	135	114	124	97	72	52	23	95	A	1360
1089	—	180	179	133	137	124	136	100	75	52	25	97	A B	1395
1093	—	183	180	137	135	122	132	102	98	69	49	94	B C	1440
1097	—	194	193	136	138	122	131	101	91	55	25	74	A	1550
1101	—	190	188	138	—	—	—	—	—	52	25	93	B	—
1109	—	187	186	—	134	—	—	—	—	—	—	—	—	—
1111	S	183	182	137	130	119	129	104	72	52	26	99	C D	1385
1117	S	187	186	139	139	122	133	109	71	51	25	93	B	1585
1119	S	183	182	131	129?	—	—	105	72	53	27	93	A B	1315
1121	S	179	176	125	128	119	—	97	68	47	28	100	C	1220
1123	S	179	176	132	131	118	—	99	63	48	23	98	D	1320
1127	S	186	183	131	135	115	—	107	68	50	27	92	A	1400
1141	S	182	177	134	129	114	—	—	65	48	—	—	—	—
1145	S	179	179	135	136	109	117	102	97	65	48	95	B C	1400
1147	S	189	188	131	135	117	129	102	70	50	28	96	B C	1420
1149	S	183	179	126	132	—	—	99	100	69	—	101	D	1295
1151	S	188	186	128	135	118	130	102	94	69	52	92	A	1380
1161	S	174	169	132	129	112	124	106	101	65	49	95	B C	1200
1163	S	191	190	124	146	122	131	99	68	53	26	96	B C	1470
1165	S	180	178	134	127	112	124	102	99	62	48	97	C D	1300
1167	S	180	178	130	137	116	128	98	97	70	50	99	C	1360
1169	S	187	184	130	135	—	—	106	103	66	51	97	C D	1400
1171	S	183	183	136	131	118	125	104	95	71	49	91	A	1390
1173	S	175	175	128	141	109	115	91	89	64	46	98	C	1345
1175	S	187	186	139	136	116	127	100	97	78	57	97	A B	1500
1177	S	189	187	133	138	115	131	101	100	67	45	99	C D	1475

[3]

Specimen No.	From HOU	Glabella-Occipital Length	Occipital Length	Basal-Bregmatic Length	Basal-Nasal Length	Basal-Nasal Length	Basal-Nasal Length	Nasal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
1279	S	195	193	183	188	116	126	105	89	26	99	77	A	1500
1281	S	174	172	183	188	128	128	100	89	26	99	77	B C	1280
1283	S	183	186	197	126	112	122	100	96	26	96	72	B C	1280
1285	S	196	196	135	143	122	133	102	99	27	97	69	B	1610
1289	S	187	187	132	124	105	113	98	93	23	95	71	A B	1300
1291	S	174	173	180	136	108	117	98	103	22	105	65	D E	1310
1293	S	191	189	131	142	122	134	97	106	21	109	62	F G	1510
1295	S	175	171	130	126	116	130	104	98	26	94	78	C	1220
1297	S	184	182	131	137	114	129	—	—	44	25	—	—	1400
1299	S	191	186	137	136	124	132	102	102	27	100	70	C D	1510
1301	S	187	185	138	136	122	132	104	100	24	96	74	B C	1495
1303	S	188	185	136	141	123	106	101	80	25	95	70	A	1585
1305	S	186	186	135	131	111	115?	98	89	23	93	70	A B	1400
1307	S	184	182	142	129	117	—	104	102	24	98	72	D	1455
1309	S	175	173	131	134	121	129	100	95	23	95	72	A B	1305
1311	S	192	191	135	135	119	133	102	103	29	101	68	D	1490
1313	S	188	185	136	142	122	131	105	100	26	95	72	A B	1545
1315	S	182	181	—	125	107	120	98	101	48	103	67	E F	—
1317	S	185	182	—	135	119	133	—	—	25	—	—	—	—
1319	S	182	179	126	131	—	—	102	95	20	92	74	A B	1280
1321	S	190	190	134	142	127	137	103	91	29	88	76	A	1540
1323	S	184	181	121	105	124	102	99	67	49	97	72	C	1240
1325	S	191	190	139	144	127	136	105	103	31	100	68	C	1625
1327	S	189	187	138	128	118	123	103	100	27	97	71	B C	1420
1329	S	188	187	135	133	113	127	102	94	26	92	74	A	1495
1331	S	183	181	135	134	114	123	101	101	48	100	70	C D	1410
1333	S	194	192	136	135	122	137	107	107	29	100	68	C	1515
1335	S	199	198	143	141	117	132	106	99	26	93	73	A B	1710
1337	S	185	183	125	135	123	137	103	101	51	98	71	C D	1325
1339	S	190	188	138	143	122	—	—	—	—	—	—	—	1600
1341	S	180	179	136	142	122	131	102	93	24	91	75	A	1480
1343	S	179	177	126	127	—	—	—	—	25	—	—	—	1220
1345	S	191	189	—	139	—	—	—	—	25	—	—	—	—
1347	S	173	172	126	—	—	—	94	90	26	96	72	B C	—
1349	S	184	183	133	131	116	127	94	95	27	101	67	C D	1365
1351	S	181	180	—	131	—	—	—	—	—	—	—	—	—
1353	S	193	190	142	143	122	133	105	100	29	95	72	A B	1670
1355	S	173	171	132	130	117	128	99	95	27	96	71	B	1260
1357	S	185	184	—	131	—	—	—	—	—	—	—	—	—

First Dynasty
From ABYDOS

Specimen No.	From ABYDOS	189	185	135	130	113	—	99	93	72	53	24	94	72	A	1410
57	—	181	181	138	136	120	134	—	—	—	—	—	—	—	—	1445
59	—	188	185	133	133	124	—	—	—	—	—	—	—	—	—	1410
61	—	176	175	136	132	121	131	100	99	65	44	27	99	69	C	1340
63	—	184	182	—	127	—	—	—	—	—	—	—	—	—	—	—
65	—	188	180	133	133	117	129	102	98	68	49	27	96	72 ¹	B C	1460
67	—	178	177	135	126	114	131	95	93	71	51	24	98	69	B C	1290
69	—	181	183	130	127	115	128	100	95	70	51	22	95	72	A B	1290
71	—	179	175	—	127	113	—	—	—	—	—	—	—	—	—	—
73	—	171	171	135	—	—	—	—	—	—	—	—	—	—	—	—
75	—	182	178	130	129	113	—	—	—	—	—	—	—	—	—	—
77	S	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1385

MALES
First Dynasty

ABSOLUTE MEASUREMENTS OF EGYPTIAN SKULLS

MALES

ABSOLUTE MEASUREMENTS OF EGYPTIAN SKULLS

From ABYDOS		Glabella	Ocipital Length	Optico-Occipital Length	Basal Height	Maximum Breadth	Breadth at Bregma	Bisymmetrical Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Index	Gonionic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
Specimen No. 78		S	181	176	131	128	—	—	—	—	—	—	—	—	—	1290
81 S		S	179	179	130	—	—	—	—	—	—	26	93	73	A	1565
83 S		S	185	184	141	141	108	124	101	94	52	—	—	—	—	—
From EL AMRAH																
127 S		S	173	173	125	130	111	130?	99	92?	68	24	98	74?	—	1190
129 S		S	184	184	138	134	119	128	100	106?	72	26	106	64½?	—	1450
511 S		S	183	183	134	133	128	137	99	101	68	24	102	63	D E	1480
513 S		S	191	191	141	134	—	—	104	—	—	—	—	—	—	1530
517 —		—	192	192	138	134	119	133?	107	—	73	26	96	72	B C	1510
519 —		—	189	187	141	136	—	—	111	105	73	23	95	74	B	1540
521 —		—	195	195	—	135	—	—	—	—	—	—	—	—	—	—
523 —		—	202	199	132	138	—	135	108	105	70	54	97	73	C	1565
525 —		—	189	188	133	141	—	137	102	98	69	50	96	72½	B C	1510
527 —		—	175	174	132	130	—	125	98	95	63	49	97	71	B C	1275
529 S		S	182	181	133	134	—	126	94	91	65	50	97	72	B C	1380
539 —		—	183½	188	141½	136½	—	—	112	105	70½	27	94	76	B	1550
From HOU																
1101 —		—	182	181	136	136	123	—	106	106	68	53	27	71	D	1430
1105 —		—	183	182	138	132	113	—	—	—	—	—	—	—	—	1365
1107 S		S	177	177	—	134	—	—	—	—	—	—	—	—	—	—
1157 S		S	174	173	136	143	122	128	99	90	64	51	25	91	A	1435
1181 S		S	174	172	133	128	—	—	—	—	53	26	—	—	—	—
1213 S		S	180	179	131	136	125	139	102	102	71	52	23	100	C	1360
1219 S		S	184	182	136	139	123	138	103	96	74	51	27	93	A	1430
1221 S		S	184	182	139	132	117	136	100	92	71	54	25	92	A	1435
1225 S		S	186	184	139	131	116	130	98	100	62	44	27	102	E	1340
1231 S		S	188	185	135	140	117	126	104	104	70	50	100	70	C D	1510
1235 S		S	191	189	130	134	—	—	100	96	76	51	28	96	A B	1415
1263 S		S	185	185	—	131	—	132?	103	98	73	51	25	95	A B	1440
1275 S		S	189	189	132	136	122	133	103	99	72	48	24	96	B	1440
1279 S		S	182	181	139	134	117	130	103	109	81	60	29	100	C	1640
1283 S		S	197	194	143	137	120	133	109	109	81	60	29	100	68	1640
1287 S		S	182	180	134	132	120	135	106	98	73	53	26	92½	75?	1370
1289 S		S	175	174	137	136	117	127	104	95	77	54	25	73½	— A	1390

Royal Tombs of 1st and 2nd dynasties

191	190	134	146	116	—	102	101	70	52	26	99	70	CD	1590
186	188	—	184	—	—	—	—	—	50	25	—	—	—	—
189	186	129	140	119	127	101	103	74	55	25	102	67	DE	1450
179	179	138	134	114	120	102	95	75	53	25	93	72 $\frac{1}{2}$	A	1390
186	183	138	136	119	128	103	98	75	52	25	95	72	AB	1485
185	183	—	141	—	—	—	—	70	50	25 $\frac{1}{2}$	—	—	—	—
188	186	137	139	—	—	—	—	—	—	—	—	—	—	—
174	173	184	137	118	130	94	87	71	51	24	93	70	A	1360
185	185	123	137	116	126	91	91	65	50	25	100	69	C	1325
183	180	129	131	116	—	99	94	68	48	25	95	78	B	1315
180	177	126	139	122	126	96	91	69	53	23	95	72	AB	1340
179	175	132	134	120	128	97	95	74	54	27	98	68 $\frac{1}{2}$	B	1350
189	186	141	142	125	141	106 $\frac{1}{2}$	102	75	54	23	96	—	—	—

[illegible]

4th & 5th dynasties
From DESHASHEH

1	181	180	185	139	121	—	100	90	—	47?	26	90	—	—	1444
2	189	184	137	140	125	—	105	101	—	58	28	96	—	—	1540
3	191	185	132	146	125	—	102	97	—	56	28	95	—	—	1565
4	195	190	142	145	125	—	105	103	—	58	26	93	—	—	1710
5	194	190	144	142	123	—	109	92?	—	58	24	84	—	—	1690
6	200	194	141	148	115	—	105	97	—	52	27	92	—	—	1775
7	182	180	139	139	114	—	101	96	—	51	26	95	—	—	1390
8	189	187	146	138	126	—	105	97?	—	56	27	92	—	—	1620
9	191	185	133	139	116	—	102	—	—	—	—	—	—	—	1500
10	187	179	—	137	—	—	—	—	—	—	—	—	—	—	—
11	179	176	125	132	113	—	97	91	—	49	26	94	—	—	1255
12	186	181	136	131	116	—	100	91	—	50	24	91	—	—	1410
13	185	185	—	137	—	—	—	—	—	—	—	—	—	—	—
14	186	184	139	142	121	—	101	95	—	55	22?	94	—	—	1560
15	183	181	142	130	114	—	103	97	—	50	24	94	—	—	1440
16	181	181	133	142	114	—	102	94	—	50	26	92	—	—	1450
17	190	185	141	143	120	—	103	96	—	55	25	93	—	—	1630
18	188	182	139	150	132	—	—	—	—	—	—	—	—	—	1670
19	195	193	142	127	121	—	115	103	—	56	30	90	—	—	1495
20	187	182	132	140	124	—	101	97	—	54	25	93	—	—	1470

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MALES
4th & 5th dynasties

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From DESHASHEH	Clabellio-Occipital Length	Ophryo-Occipital Length	Basal-Bregmatic Height	Basal-Occipital Length	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gnathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
<i>Specimen No.</i> 21	187	182	—	141	118	—	—	—	—	—	—	1480
22	182	180	140	137	113	—	50	25	96	—	—	1475
23	188	183	130	142	115	—	48	24	98	—	—	1610
24	185	178	143	143	123	—	52	22	95	—	—	1400
25	177	175	141	132	115	—	49	22	90	—	—	1475
26	175	168	135	147	123	—	53	25	101	—	—	1570
27	193	191	136	141	122	—	51	25	92	—	—	1485
28	183	179	137	139	116	—	50?	24	90	—	—	1560
29	191	189	136	141	117	—	—	—	—	—	—	1570
30	186	181	139	143	114	—	53	24	88	—	—	—
From MEDIUM												
31	184	—	142	141	122	132	101	97	96	71	B	1570
32	182	—	138	137	126	136	102	—	—	—	—	1465
33	186	—	135	144	122	130	107	106	99	69½	C	1540
34	185	—	136	140	121	130	105	97	91	75	A	1495
35	186	—	140	137	121	—	106	95	90	76	A	1520
36	171	—	131	135	113	—	94	—	—	—	—	1290
37	177	—	140	136	116	125	109	102	94	74½	AB	1430
38	190	—	134	140	120	124	101	92	91	78	B	1515
39	180	—	136	135	115	—	102	98	94	71	B	1405
40	173	—	130	132	115	122	100	95	95	72	AB	1260
41	195	—	139	150	121	128	103	103	102	68	DE	1730
42	186	—	135	136	119	—	103	102	99	70	C	1450
43	185	—	137	138	118	118	103	101	97	71	C	1490
44	179	—	139	140	120	131	102	99	92	71	BC	1480
45	190	—	128	138	111	122	98	95	97	71½	BC	1430
46	178	—	130	143	113	—	92	—	—	—	—	1400
47	181	—	127	132	111	122	96	95	99	70	C	1290
48	180	—	137	141	124	—	97	92	95	70	A	1560
49	180	—	126	139	125	—	99	—	—	—	—	1340
50	178	—	123	133	113	131	99	90	91	74	A	1235
51	187	—	138	140	—	—	—	—	—	—	—	1535
52	176	—	135	141	127	127	—	—	—	—	—	1530
53	184	—	139	141	120	129	101	91	91	75½	A	1530
54	188	—	137	140	118	126	106	106	100	69½	CD	1535

6th-12th dynasties

From DENDERAH

<i>Specimen No.</i> 1	198	198	138	—	126	131	109	107	98	71	C	—
6	187	186	137	132	115	125	100	99	99	69½	C	1395
7	183	182	138	132	117	126	106	98	92	70	AB	1420
13	181	179	136	132	106	116?	97	89	85	76	A	1380
15	178	177	131	127	119	129	99	101	92	76	A	1260
20	176	172	126	136	111	120	101	99	98	70	C	1285
21	187	187	134	141	116	124	97	101	63	68	F	1505
22	178	177	123	132	113	120	91	89	72	68	BC	1230
25	174	171	133	127	109	123	99	96	70	71	BC	1250
26	176	175	132	133	112	116	94	86	66	47	A	1315
27	186	183	129	133	116	127	104	96	69	52	A	1360
28	172	171	133	130	109	117	101	98	72	70	B	1270
29	173	173	131	137	105	111	98	96	97	70	BC	1385

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MALES
6th-12th dynasties

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From DENDERAH	Clabellio-Occipital Length	Ophryo-Occipital Length	Basal-Occipital Length	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gnathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
<i>Specimen No.</i> 31	—	—	—	—	—	—	—	—	—	—	—
32	179	182	178	137	136	115	126	108	104	101	1460
33	176	175	181	127	128	115	122	98	92	96	1220
38	187	186	141	140	114	121	105	99	92	94	1440
40	185	184	131	136	110	—	97	92	78	71	1570
51	183	183	139	132	104	111	96	93	68	102	1490
53	185	184	135	138½	116	130	103	96	78	98	1470
55	185	183	138	140	120	124	108	102	68	94	1520
56	175	175	—	138	—	—	—	—	—	—	—
57	168	165	135	140	116	125	97	87	78	90	1350
60	172	172	129	131	114	123	93	90	71½	97	1240
61	184	181	128	127	112	124	98	108	62	110	1275
63	190	187	134	136	—	123	—	—	—	—	1475
64	181	180	140	126	114	123	103	95	75	92	1360
66	189	187	—	129	115	125	103	97	74½	96	1380
67	175	174	130	134	110	120	97	93	75	96	1300
69	188	182	137	127	109	116	99	95	78½	96	1355
71	171	171	131	130	107	117	95	90	78	95	1285
74	176	174	134	139	117	126	103	95	77	92	1390
76	175	174	—	126	110	115	—	64	—	—	—
77	185	182	134	133	115	121	108	105	66	102	1405
79	185	183	136	135	119	135	103	98	70	95	1445
80	185	183	139	134	113	122	100	96	71	96	1465
81	183	185	125	138	119	129	105	99	71	93	1405
82	181	179	135	132	123	133	102	91	81?	90?	1370
83	185	181	127	129	111	124	102	98	74	96	1290
84	177	174	134	132	112	125	100	101	67	101	1330
85	178	177	125	127	105	—	96	83?	61?	48	1200
89	188	184	138	158	122	133	99	91	78	92	1740
94	182	181	138	142	117	126	101	102	73	92	1515
99	183½	182	138	136	121	—	—	—	67½	101	1405
100	179	179	133	132	111	120	91	88	72	97	1335
103	176	172	129	132	114	119	85	83	71	97	1275
105	167	167	126½	133	110	115	98	97	65	48	1190
106	180	180	133	133	114	119	95½	—	66	45	1355
109	180	178	132	134	118	127	97	91	59	45	1360
113	181	181	135	140	110	119	100	97	70	50	1460
114	190	187	145	139	116	124?	105	101	69	56	1630
117	177	172	132	131	112	121½	104	99	69	52	1305
119	182	180	135	135	114	127	103	108	73?	52	1410
121	185	185	140	141	113	125	99	98½	67	50	1550
122	173	173	136	130	112	120	99	90	75	53	1315
126	186	186	141	139	111	119	100	100	61	46	1550
127	176	176	142	138	115½	122	100	99	70	46	1415
129	194	190½	138	128	111	—	110½	104	73	53	1460
130	188	186	140	132	111	123½	107	109	75	55½	1480
131	175	174½	132	125	119	126	98	101	66	48	1230
132	185	182	137	137	119	128	99	92	71	50	1480
133	178	176	127	131	115	123	99	97	68	48	1260
135	187	186	138	132	114	131	102	100	70	54	1450
137	176	176	133	141	115	127	98	93	71½	51	1430

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From DENDERAH		Glabello-Occipital Length	Optic-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity	
Specimen No.	S	178	175 ¹	141	140	123	131	100	95	70	52	25	95	72	A B	1490
138	S	198	195 ¹	136	133	112	121 ²	99	95	68	52	26	96	72	B C	1410
141	S	183	182	140	132	112	124	102	89 ²	69 ²	49	27	—	84 ²	—	1550
144 A	S	197	197	137	134	117	134	105 ¹	101	70	52	27	96	73 ¹	B C	1450
145 A	S	187	185	134	136	117	134	105 ¹	101	70	52	27	96	73 ¹	B C	1450
146 A	S	184	181	139	134	114 ¹	127	104	101	74	55	27	97	71	B C	1460
142 B	S	181	181	138	132	116	127	103	97	74 ²	55	27	94	72	A	1400
146 B	S	183	182	134	137 ¹	115	128	100	97 ¹	81	53	24	97 ¹	66 ¹	A	1440
147 S	S	184	184	136	138	120	125	94	95 ²	65 ²	49	82	101	68 ²	A	1470
150	—	180	179	123	123	114	120	99	92	69	51 ¹	28	93	74	A B	1160
152	S	184	182	135	138	114 ¹	122	102	100	70	50	25	98	71	C	1460
154	S	177	176	135	135	114	128	102	94	66 ²	47	26 ¹	92	77 ²	B	1370
156	S	181	179	131 ¹	134	112	127	103	98	70	50 ¹	26 ¹	95	73	B	1350
159	S	180	180	137	144	—	125	98	98	69	51	29	100	69	C	1510
160	S	189	188	135	135	123	134	109	101	57	53 ²	29	93	75	A B	1465
163	S	186	181 ¹	139	131	113	126	106	98 ²	74	57	26	93	—	—	1440
165	S	193	192	138 ¹	133 ¹	120	129	107	100	76	56	25	94	73	A	1510
168	S	181	179 ¹	137 ¹	129	112	—	99 ¹	98 ¹	69	49	26	99	70	C D	1360
170	S	179	177 ²	137 ¹	136	117	129	100	99	71	52	26	99	69	C	1420
171	S	196	194 ¹	142	136	122	—	111	93 ²	65 ²	51	30	90	—	—	1610
175	S	182	179	134	130	115	127	104	101	69 ¹	54	27	97	72	B C	1345
176	S	188	186	138	137	117	128	104	103	70	52	26	99	71	D	1510
177	S	189 ¹	188 ¹	137 ¹	136	116	122 ¹	103	97	72	49 ¹	25	94	73	A	1500
180	S	178	174	142	134	112	125	108 ¹	101	68	54	29	97	73 ¹	A B	1440
182	S	185	183	134	129 ¹	113	125	104	101	72	51	29	97	73 ¹	—	1360
183	S	187	185	135	134	111	122	104	99	72	52	26	95	73	B	1440
184	S	186	186	143	141	115 ¹	127	105	102	70	53	25 ¹	97	72 ¹	C	1595
185	S	178	176	136	136	111	125	98	94	57	46	25	96	76	C D	1400
187	S	176	175	133	125 ¹	113	126 ²	99	100	65	47	24	101	69 ¹	D E	1245
188	S	190	191	140	139	111	122	100	93	72	52	25	93	73	A	1575
190	—	186	185	128	137	111	115	99	99 ¹	73	51	26	101	68	D	1390
193	—	186	186	137 ¹	136	120	127	104	103	73	52	26	99	70	C D	1470
195	S	199	196	145	140	118	—	108	98	79 ¹	55	26	91	74	A	1720
196	S	173	173	133	130	112	122	95	91	70	51 ¹	26	96	70 ¹	B	1270
199	S	181	180	131	129	—	—	104	98	72	51	27	94	73 ¹	A B	1500
200	S	181	180	135	127	115	127	106	103	75	56	27	97	71	B C	1320
203	S	175	171	132	137	113	127 ¹	99	98	67	49	26	99	70	C D	1345
204	S	190	189	142	142	113	127	105	98	73	53 ¹	27	93	72	A	1630
206	S	176	175	132	135	116	129	99	91	62 ²	51	25 ¹	92	78 ²	—	1830
208	S	176	174	137	136	118	—	—	—	—	—	—	—	—	—	1395
209	S	191	190	134	126	114	125	100 ¹	99 ¹	78	55	26	99	67	B	1370
211	S	171	171	140	143	103	—	—	—	—	—	—	—	—	—	1455
212	S	176	174	132	132	112	120	98	92	66	47	24	94	74 ¹	A B	1300
214	S	179	179	135	139	113	129	102	97	69	53	27	95	73	B	1430
215	S	191 ¹	192	134	136	118	125	99	92	72	51	27	93	73	A	1450
217 A	S	173	172	130	137	108	122	95	94	72 ¹	50 ¹	25	99	68	B C	1310
219	S	183	180	135	133 ¹	112 ¹	126	100 ¹	97	71	52	25	97	71	B C	1400
220	S	190	187	137	146	118	133 ²	105	96	68	44 ¹	28 ¹	91	77	A	1615
224	—	182	179	136	139	116	131	99	100	71 ¹	47 ¹	25	95	68	D	1465
228	S	179	179	135	136	111	—	96	91	70 ¹	49	25	95	71 ¹	A B	1400
229	—	178	178	128	132	107	112	96	86	73	52	26	90	78	A	1280
231	S	178	177	135	128	110	122	99	95	70	51	26	96	71 ¹	B	1310
233	S	183	181	135 ¹	138 ¹	121	130 ¹	108	104 ²	75	53	25 ¹	96	72	—	1450

From DENDERAH		Glabello-Occipital Length	Optic-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity	
Specimen No.		179	179	177	139	139	109	124	99	94	70	51	95	72	A	1470
240	S	179	176	176	133	138	114	129 ²	101	95	81	55	94	69	A	1400
244	S	180	178	140	130	123	131	104	99	75	50	25	95	72	A B	1395
245	S	184	180	132	130	107	116	99	92	71 ¹	48	26	93	73	A	1360
246	—	189	189	144	141	122	132	111	101	72 ²	54	25	107	64	F	1635
247	S	183	183	142	149	121	128	108	106	71	51	27	98	72	C D	1760
248	S	183	182	133	127	109	128	99	94	68	48	26	95	73	B	1315
252	—	173	170	127	134	116	122	96	89	62	51	22	93	76	A B	1250
253	—	185	185	133	130	107	116	99	92	71 ¹	48	26	93	73	A	1360
254	S	191	190	139	145	116	127	102	95	72	54	25	93	74	A B	1640
255	S	201 ¹	200 ¹	132	145	118	123	106	97	71 ²	47	25	92	76	A	1635
257	S	197	192 ¹	138	140	121	136	105	98	72	50	30	93	74	A B	1620
258	S	179	178	127	127	112	121	97	92	66	49	26	95	74	B	1230
259	S	177	175	120	138 ¹	112	125	98	101	72 ¹	53	25	103	66	E	1250
260	S	183	182	123	132	112	123	95	91	67 ¹	49 ¹	24	96	71 ²	B	1265
262	S	177	175	142	138	112	120	103	96	65 ¹	53	25	93	76 ¹	A	1475
265	S	188	187	138	133	113	124	102	92	67	51	24	90	78	A	1465
266	S	176	174	138 ¹	131 ¹	112	119	97	94	70	46	23	97	70 ¹	B C	1350
268	S	190 ¹	187	135 ¹	127	114 ¹	127	106	97	76	56	26	92	74	A	1385
270	S	192	189	139 ¹	139	125	135	104	99	67	50 ¹	25	95	74 ¹	B C	1580
272	S	186	183	138	141	122	131	99	91	71	52	26	92	74	A	1540
274	S	191	189	137 ¹	139	109	124	103	97	68 ¹	53	22	94	74 ¹	A B	1550
276	S	181	177	140	133	110	123	104	96	76	55 ²	27 ²	92	73 ¹	— A	1430
278	S	190	186	137	136	119	131	104	92	75	55 ¹	26	88	76	— A	1510
279	S	183	181	131	124	110 ¹	120	99	93	67	45	25	94	74	A B	1260
281	S	181	180	139 ¹	140	113	124	98	93	67 ¹	53	26	95	65 ¹	— A	1500
282	S	185	184	139	139	115	124	104	103	64 ¹	47	27	99	72 ¹	D E	1520
283	S	184	183	137	138	116	130	104	101	73	52	28 ¹	97	71	B C	1480
285	S	183	183	131	132	111	121	100	96	68	51	26	96	72 ¹	B C	1350
286	S	175	174	127	130	109	116	90	86	67	52 ¹	24	96	70 ¹	B	1230
288	S	179	176	132	128	113	125	105	96	70	51 ¹	21	91	76 ¹	A	1285
289	S	180	177	129 ¹	131	115	128 ¹	103	94 ²	70	49	27	91	76	—	1235
291	S	184	183	131	131	109	117	102	95	74	51 ¹	26	93	73	A	1345
292	S	181	177	141	125	110	121	101	94	65	48	26	93	76 ²	— A	1360
293	S	183	181	141	136	108	—	100	98	68	49	23	98	71	B C	1495
298	S	183	190	141	137	120	131	109	106	77	55	29	97	71	B	1385
300	S	174	172	135	135 ¹	112	—	95	91	68	46	26	96	71	B	1330
301	S	180	176	125	138	115	124 ²	94	92	70	49	25	98	69	B C	1320
302	S	186	184	136	134 ¹	118	128	100	96	75	55	28	96	70	A E	1440
304	S	184	183	142	134 ¹	120	130	102	106	72	51	28	104	66 ¹	B	1490
308	S	182	181	138	140	109	119	100	96	71	49	26	96	71	— B	1495
309	S	178	177	135	128	110	128	99	95	70	52	27	96	71 ¹	B	1310
311	S	185	182	141	135	111	122	103	97	67	51	30	94	75	B C	1500
312	S	186	184	140	135	118	129 ¹	100	96	69	50	26	96	72	B C	1500
315	S	186	184	133	133 ¹	112	127 ¹	99	97	66	46	25	98	72	C D	1400
316	S	180	179	130	131 ¹	120	129	99 ²	96 ²	65	52	25	87	—	1305	1805
317	S	185	183	138	134	117	126	99	96	70	54	26	97	71	B C	1455
319	S	192	191	135	131	116	127	107	100	75	56	29	94	73 ²	A B	1444
320	S	177	176	134	141	110	119	101	88	72	52	25	87	77	— A	1420
323	S	171	171	136	131	114	121	96	92	70	52	25	96	71 ¹	B	1300
324	S	183	181	134	136	113	122	100	96	68	49	30	96	72	B C	1420
325	S	180	178	142	138	116	125	105	99	76	52	24 ¹	79	75	A	1500

MALES

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

6th-12th dynasties

From DENDERAH		Glabello-Occipital Length	Occipital Length	Ophtymo-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Alveolar Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
Specimen No.	327	188	185	136	133	123	132	106	102	96	51	27	96	78 $\frac{1}{2}$	B C	1450
328	S	178	177	129	133	—	—	—	—	—	—	—	—	—	—	1300
329	S	178	178	128	133	113	—	97	86	89	50	30	89	79	A	1280
330	S	174	174	123	132	107	119	94	85 $\frac{1}{2}$	91	51	25	91	73 $\frac{1}{2}$	A	1200
332	S	179	178	143	133	120	126 $\frac{1}{2}$	102	91	92	55	25	92	74	A	1450

12th-15th dynasties

From HOU		Glabello-Occipital Length	Occipital Length	Ophtymo-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Alveolar Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
Specimen No.	1	179	178	131	143	115	129	98	92	94	53	23	94	73	A	1425
3	S	183	183	131	138	114	123	98	92	93	53	25	93	74	A B	1505
5	S	183	181	137	140	120	133	102	96	94	51	24	94	73	A	1360
7	S	184	182	133	133	111	121	106	100	94	55	25	94	73	A	1385
9	S	185	182	128	134	120	128	101	103	73	51	24	102	67	D E	1350
11	S	186	185	134	136	123	133	106	104	98	55	25	98	68	B	1440
13	S	186	186	134	132	110	123	98	91	98	51	24	98	74	A B	1400
15	S	176	176	129	130	107	118	99	99	70	49	26	100	69	C	1255
17	S	186	184	131	140	120	133	102	100	98	50	26	98	71	C	1450
19	S	184	183	130	129	117	130	95	91	72	57	22	96	69 $\frac{1}{2}$	A B	1310
21	S	191	190	138	143	118	132	99	96	97	50	23	97	69 $\frac{1}{2}$	B	1600
23	S	191	189	126	132	120	131	101	100	67	49	24	99	70	C D	1350
25	S	183	181	137	146	119	126	99	94	69	52	25	96	72 $\frac{1}{2}$	A B	1560
27	S	183	182	143	142	—	—	104	96	75	49	23	92	74	A	1575
29	S	174	172	131	130	117	124	100	98	73	54	25	93	72	A	1260
31	S	185	184	140	134	120	132	105	100	75	54	27	95	71 $\frac{1}{2}$	A B	1475
33	S	189	187	131	129	113	127	103	96	76	57	28	98	72	A	1360
35	S	179	177	124	138	117	126	103	96	66	49	24	103	69	F G	1300
37	S	182	180	134	136	120	133	102	94	71	51	27	92	74 $\frac{1}{2}$	A	1245
39	S	174	173	122	130	114	117	97	90	69	52	21	93	73	A	1175
41	S	190	189	136	122	—	—	106	99	69	49	25	93	75	A B	1340
43	S	173	172	126	125	110	121	98	97	68	49	26	99	70	C D	1160
45	S	177	175	134	124	112	127	98	94	63	46	27	96	74	B C	1250
47	S	178	175	132	137	122	130	102	99	70	49	26	97	71 $\frac{1}{2}$	B C	1370
49	S	185	185	129	138	116	127	101	106	71	47	25	105	66	E F	1400
51	S	183	179	135	133	120	127	98	94	74	54	23	96	70	A B	1400
53	S	184	181	132	129	123	133	104	98	71	53	26	94	73 $\frac{1}{2}$	A B	1330
55	S	183	182	134	132	114	123	100	100	66	48	27	100	70	C D	1375
57	S	184	181	135	129	117	132	100	101	78	57	26	101	66	C D	1365
59	S	173	173	134	132	117	127	99	90	68	50	25	91	75 $\frac{1}{2}$	A	1300
61	S	182	182	128	129	115	126	102	94	70	49	25	92	75 $\frac{1}{2}$	—	1280
63	S	181	179	131	135	116	126	101	90	73	54	25	89	75 $\frac{1}{2}$	—	1360
65	S	183	180	130	138	118	128	97	96	74	48	23	99	68	B C	1400
67	S	192	192	144	136	117	128	99	87	75	55	24	88	75	A	1600
69	S	178	177	136	131	115	125	95	95	75	52	24	100	66 $\frac{1}{2}$	B C	1350
71	S	185	185	136	134	114	124	97	93	72	54	24	96	70 $\frac{1}{2}$	B	1435
73	S	177	176	124	136	112	124	98	96	68	47	21	98	71	C	1370
75	S	186	186	132	132	121	126	100	98	63	53	24	98	69	B C	1390
77	S	176	176	131	129	115	124	101	95	73	54	22	94	71	A	1265
79	S	186	185	130	130	108	120	103	107	72	49	23	104	66 $\frac{1}{2}$	E	1340
81	S	191	188	136	138	123	133	105	97	74	54	27	92	74	A	1525
83	S	188	184	127	—	—	—	107	102	69	53	26	95	74	B	—
85	S	174	174	134	120	112	122	99	94	63	49	23	95	72 $\frac{1}{2}$	A B	1190
87	S	184	181	133	136	121	134	101	97	73	53	26	96	71	B	1415
89	S	182	180	135	141	115	127	106	99	76	56	28	98	73	A	1475

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MALES

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

12th-15th dynasties

From HOU		Glabello-Occipital Length	Occipital Length	Opistho-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Alveolar Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity	
Specimen No.	91	180	176	136	130	110	123	121	95	94	68	49	24	99	C	1355	
93	S	182	181	132	131	110	121	100	97	77	55	25	97	69	A B	1340	
95	S	180	179	129	132	117	127	99	105	65	47	27	106	66	G	1300	
97	S	185	183	132	137	114	127	96	91	69	50	28	95	72	A B	1420	
99	S	183	182	132	143	119	128	98	96	75	53	25	98	73	A B	1470	
101	S	184	184	135	128	—	—	—	113	113	75	51	27	100	70	C D	1355
103	S	187	186	140	135	—	—	—	106	107	70	50	27	101	69 $\frac{1}{2}$	D E	1505
105	S	181	180	136	127	116	129	98	106	68	45	32	103	63	G	1330	
107	S	184	184	134	133	111	122	101	99	66	48	27	98	71	C D	1395	
109	S	192	191	—	136	—	—	—	—	—	—	—	—	—	—	—	—
111	S	182	181	133	124	114	123	103	103	65	48	26	100	71	D E	1275	
115	S	—	—	—	—	—	—	—	—	—	44	25	—	—	—	—	—
From ABYDOS																	
119	—	191	187	128	140	124	134	102	98	80	57	28	96	69	A B	1460	
121	—	184	181	140	135	125	136	105	90	80 $\frac{1}{2}$	56	27	86	76 $\frac{1}{2}$	—	1480	
123	—	176	175	128	132	111	121	96	88	67	51	22	86	79	A	1265	
125	—	192	187	139	133	116	125	103	95	67	50	24	92	76 $\frac{1}{2}$	A	1510	
127	—	195	190	135	144	124	132	104	90	78	51	25	86 $\frac{1}{2}$	78	A	1610	
129	—	176	176	134	137	115	124	103	98	68	50	24	95	74	B	1375	
131	—	177	172	131	131	108	116	94	92	64	49	26	98	71	C	1290	
133	—	176	174	127	126	110	118	95	90	69	49	25	95	71 $\frac{1}{2}$	A B	1200	
135	—	188	185	147	141	115	129	100	95	71 $\frac{1}{2}$	51	25	95	72 $\frac{1}{2}$	—	1660	
137	—	180	180	133	140	119	128	97	94	68	49	24	97	71	B C	1425	
139	—	184	183	140	141	118	124	99	95	67	52	23	96	72 $\frac{1}{2}$	B C	1545	

18th dynasty

From SHEKH ALI																										
Specimen No.	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	
184	183	183	181	183	186	136	135	113	—	102	94	69	49	25	92	75 $\frac{1}{2}$	A	1440								
183	181	183	181	133	131	113	—	—	103	95	69	54	25	92	75 $\frac{1}{2}$	A	1355									
192	190	135	135	119	133 $\frac{1}{2}$	107	104	77	53	27	97	60	70	69	70	C	1490									
180	177	137	136	111	122	98	98	69	53	20	100	69	70	69	70	B	1425									
189	187	132	130	116	127	101	90	67	49	23	89	78	—	A	1380											
195	194	137	131	115	127	104	102	76	53	23	93	69 $\frac{1}{2}$	BC	1490												
184	181	130	136	121	135	99	95 $\frac{1}{2}$	66 $\frac{1}{2}$	70	51	23	103	66	DE	1270											
175	173	131	130	114	125	96	99	70	64	46	23	87	185													
185	185	139	145	109	117	100	87 $\frac{1}{2}$	64	46	23	87	185														
178	178	127	138	116	128	94	93	63	46	23	99	70 $\frac{1}{2}$	CD	1330												
186	185	133	129	111	124	103	101	65	49	25	98	72 $\frac{1}{2}$	D	1360												
175	171	124	133	112	120	105	101	68	49	24 $\frac{1}{2}$	100	71	D	1230												
183	183	139	147	—	—	98	81	69	—	—	83	81	—	A	1590											
185	183	140	133	118	126	100	95	71	54	24	95	72	AB	1465												
181	181	128	137	113	118	98	93	65	49	23	95	74	B	1250												
174	174	134	134	120	126	105	101	72	56	24	96	72	BC	1330												
183	182	134	131	118	128	95	97	66	47	27	102	68	DE	1365												
138	181	130	135	115	128	98	91	69	49	26	93	74	AB	1365												
188	186	137	136	116	128	107	102	74	53	25	95	72 $\frac{1}{2}$	AB	1510												
184	181	128	133	122	127	100	97	81	60	24	97	67 $\frac{1}{2}$	AB	1330												
182	180	132	132	112	128	100	97	72	55	26	97	70	BC	1350												
183	181	133	134	117	128	106	92	70	52	26	87	80	—	A	1390											
185	184	140	134	112	122	110	103	71	53	26	94	76	BC	1475												
184	181	140	131	111	123	100	97	68	51	26	97	72	BC	1465												
184	181	138	137	116	132	102	91	76	53	24	97	74	—	A	1430											

MALES
18th dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

MALES
18th dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From SHEKH ALI		Glabeol	Occipital	Optic	Occipital	Basal	Maximum	Biauricular	Bizygomatic	Basal-Nasal	Alveolar	Nasal	Nasal	Height	Alveolar	Index	Gonathic	Prognathism	Estimated	Capacity	
Specimen No.		51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81				
1	—	186	183	128	123	110	123	110	123	101	95	66	50	27	94	94	74	A B	1245	—	
3	—	189	187	126	137	116	—	—	—	—	—	—	—	—	96	—	71	B	1390	—	
5	—	187	186	138	133	115	125	115	125	103	99	73	54	24	100	100	69	C D	1460	—	
7	—	181	180	130	131	114	121	100	100	100	100	71	48	23	100	69	70 ¹	A B	1310	—	
9	—	187	182	127	127	112	119	100	99	67	51	21	99	70 ¹	99	70 ¹	70 ²	C D	1280	—	
11	—	182	178	132	132	115	124	96	91	67	53	25	53	25	95	71 ¹	71 ²	A B	1350	—	
13	—	175	174	133	136	113	121	102	93	67	45	25	51	24	92	74	76	A B	1345	—	
15	—	181	177	125	129	116	119	98	90	69	51	24	92	74	92	74	74	A B	1240	—	
17	—	174	173	126	138	116	124	96	100	66	51	24	104	66	104	66	76	E	1285	—	
19	—	191	187	138	131	—	129	107	100	68	52	23	93	76	93	76	76	A B	1470	—	
21	—	184	181	125	134	123	130	94	96	65	48	24	102	68	102	68	68	D E	1310	—	
23	—	180	175	130	137	116	127	99	93	71	52	27	94	72	94	72	72	A	1360	—	
25	—	186	185	130	131	103	119	96	91	61	46	25	95	75	95	75	75	B C	1345	—	
27	—	170	168	135	140	108	123	94	92	66	49	25	98	70 ¹	98	70 ¹	70 ²	C	1365	—	
29	—	175	174	131	140	113	127	102	99	69	50	25	97	72	97	72	72	B C	1365	—	
31	—	177	175	127	127	111	127	98	95	64	48	25	97	72 ¹	97	72 ¹	C	1210	—		
From ABYDOS																					
1	—	184	180	138	133	117	123	102	97	75	53	25	95	71 ¹	95	71 ¹	A B	1330	—		
3	—	183	182	138	140	121	131	102	97	75	54	22	95	71	95	71	A B	1450	—		
5	—	179	178	133	134	108	124	100	93	71	51	24	93	73	93	73	A	1355	—		
7	—	182	178	132	138	118	129	91	84	76	55	27	92	68 ¹	92	68 ¹	A	1410	—		
9	—	193	191	132	139	120	129	105	96	76	55	26	91	73 ¹	91	73 ¹	A	1505	—		
11	—	173	172	133	125	111	119	100	94	68	49	24	94	73 ¹	94	73 ¹	A B	1225	—		
13	—	187	186	137	136	121	130	99	91	70	49	25	92	—	92	—	C	1430	—		
15	—	182	179	140	135	114	122	97	97	69	49	25	100	69	100	69	—	C	1460	—	
17	—	182	180	129	136	124	134	102	95	78	56	28	93	71	93	71	A	1355	—		
19	—	192	191	134	138	116	128	103	98	70	51	27	92	76 ¹	92	76 ¹	A	1510	—		
21	—	184	181	130	137	122	129	104	97	73	52	27	93	73 ¹	93	73 ¹	A	1395	—		
23	—	190	186	135	143	125	134	105	98	74	55	26	93	73	93	73	A B	1560	—		
25	—	196	192	137	139	122	134	105	98	73	54	26	93	74	93	74	A	1590	—		
27	—	179	177	129	139	117	122	96	85	67	53	26	89	—	89	—	—	A	1265	—	
29	—	188	180	137	142	121	129	101	96	74	54	27	95	71 ¹	95	71 ¹	A B	1515	—		
31	—	188	184	143	141	123	131	103	95	73	56	30	92	72	92	72	A	1615	—		
33	—	182	181	131	138	116	124	96	95	72	52	26	99	68	99	68	B C	1400	—		
35	—	191	190	135	146	121	127	103	94	69	51	28	91	76	91	76	A	1600	—		
37	—	183	180	120	130	108	123	96	96	64	49	29	100	70	100	70	C D	1215	—		
39	—	197	195	136	139	121	130	98	87	73	53	25	89	74 ¹	89	74 ¹	A	1585	—		
41	—	200	199	137	138	118	130	112	102	71	53	26	91	77 ¹	91	77 ¹	A	1610	—		
43	—	184	182	143	140	122	132	107	99	73	58	26	93	75	93	75	A B	1565	—		
45	—	187	180	132	140	124	136	103	99	74	51	29	96	71	96	71	B	1470	—		
47	—	197	196	138	136	121	133	107	107	71	53	26	100	—	100	—	—	A	1570	—	
49	—	185	185	144	147	122	—	—	103	83	67	55	86	—	86	—	—	—	1605	—	
51	—	183	180	126	141	119	128	102	93	74	66	26	91	74	91	74	A	1385	—		
53	—	177	172	137	138	118	127	98	99	74	54	25	101	67	101	67	C D	1425	—		
55	—	187	182	140	140	127	131	103	96	71	52	25	93	74 ¹	93	74 ¹	A B	1560	—		
57	—	181	178	129	137	120	134	110	103	69	52	26	94	76	94	76	A B	1360	—		
59	—	189	187	137	135	122	136	105	98	72	52	23	93	74	93	74	A B	1485	—		
61	—	185	182	128	134	113	121	93	89	67	50	22	96	71	96	71	B	1350	—		
63	—	187	186	141	138	123	131	96	83	74	53	26	86	75	86	75	A	1525	—		
65	—	186	182	138	136	120	133	101	95	74	54	23	94	72	94	72	A	1485	—		
67	—	187	186	135	137	126	131	108	101	68	51	25	94	76 ¹	94	76 ¹	B	1470	—		
69	—	185	183	131	134	118	124	100	101	70	50	26	101	68	101	68	D	1485	—		

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From ABYDOS		Glabeol	Occipital	Optic	Occipital	Basal	Maximum	Biauricular	Bizygomatic	Basal-Nasal	Nasal	Alveolar	Nasal	Height	Alveolar	Index	Gonathic	Prognathism	Estimated	Capacity
Specimen No.	71	186	179	178	181	131	138	115	125	97	54	70	54	24	92	92	73	A	1430	—
73	—	179	178	181	131	134	114	125	98	94	72	53	27	96	96	71	B	1335	—	—
75	—	189	187	132	132	116	124	104	97	73	50	23	93	73	73	73	A	1400	—	—
77	—	193	187	141	139	128	136	100	92	71	50	27	92	74	74	74	A	1610	—	—
79	—	190	185	140	138	122	130	105	97	69	51	26	92	76	92	76	A	1560	—	—
81	—	178	175	129	131	114	125	99	95	68	50	27	96	72	96	72	B C	1280	—	—
83	—	187	183	122	137	119	134	107	99	72	54	27	93	75	93	75	A B	1380	—	—
85	—	191	188	130	138	123	135	107	101	66	57	27	94	72	94	72	A	1460	—	—
87	—	183	179	130	129	112	123	101	99	68	52	26	98	71	98	71	C	135	—	—
89	—	184	182	140	144	121	131	99	99	72	54	29	100	68 ¹	100	68 ¹	C	1580	—	—
91	—	180	177	131	136	119	129	98	95	67	51	23	97	71 ¹	97	71 ¹	B C	1365	—	—
93	—	182	177	134	137	125	132	103	98	70	57	24	97	69	97	69	A	1420	—	—
95	—	189	189	134	146	119	132	98	99	74	57	27	101	—	101	—	A	1570	—	—
97	—	190	187	141	140	119	129	101	92	71	52	24	91	74 ¹	91	74 ¹	A	1595	—	—
99	—	177	176	132	139	112	126	96	91	67	48	26	95	72 ¹	95	72 ¹	A B	1380	—	—
30th dynasty																				
Specimen No.	1	175	178	138	132	113	124	99	91	69	49	27	92	74	92	74	A	1310	—	—
3	—	185	185	135	131	113	121	100	95	74	53	25	95	71	95	71	A B	1385	—	—
5	—	181	178	126	140	116	129	100	97	72	56	26	90	70	90	70	B	1360	—	—
7	—	186	184	138	136	119	126	105	94	72	54	26	90	76	90	76	A	1485	—	—
9	—	186	184	131	132	115	125	103	95	73 ²	53	25	88	78 ¹	88	78 ¹	A	1365	—	—
11	S	179	178	124	129	118	129	96	90	62	48	24	94	75 ¹	94	75 ¹	B	1220	—	—
13	S	177	176	132	129	116	126	100	93	65	51	23	93	78	93	78	A	1195	—	—
15	S	186	183	135	132	121	133	101	90	68	52	27	89	78	89	78	A	1410	—	—
17	S	179	175	131	137	122	132	100	99	68	55	26	99	70	99	70	C D	1370	—	—
19	—	180	180	134	133	113	125	99	90	67	53	27	91	76	91	76	A	1365	—	—
21	—	181	175	131	132	125	135	105	100	79	55	26	95	70 ¹	95	70 ¹	A	1330	—	—
23	S	185	185	125	129	118	135	99	99	70	55	26	100	—	100	—	A	1270	—	—
25	S	186	185	135	145	115	128	101	92	78	55	26	91	74	91	74	A	1550	—	—
27	S	185	183	130	130	121	127	104	98	69	51	28	94	74	94	74	A B	1330	—	—
29	S	185	181	131	133	119	136	103	98	74	55	25	95	72	95	72	A B	1370	—	—
31	—	175	172	125	128	112	120	99	95	66	49	24	96	73	96	73	B C	1190	—	—
Ptolemaic period																				
Specimen No.	335	186	185	134	137	123	133	109	107	77	54	29	98	70	98	70	C	1450	—	—
336	S	190	189	128	141	123 ¹	132	124	95	72	73	25	—	73	—	73	A	1460	—	—
338	—	174	174	130	141	116	122	93	87	66	49 ¹	24	94	75	94	75	A	1360	—	—
341	S	183	182	130	130	112	124	103	—	—	56	28	96	71	96	71	B	1410	—	—
344	S	187	185	131	135	120	130	103	99	74	51 ¹	24	96	71	96	71	B	1410	—	—
348	S	179	178	120	138	115	123	97 ¹	92	63	46	25	94	75	94	75	B	1215	—	—
350	S	176	175	135	131	115	122	98	90	72	50	26	92	73	92	73	A	1320	—	—
353	—	190	189	137	140	125	138	108	94	81	60	23	87	75	87	75	A	1550	—	—
354	—	172	172	130	139	117	123	95	90	63	48	23	95	74	95	74	B	1320	—	—
356	—	183	183	134	140	116	125	97	90	67 ¹	51	24	93	74	93	74	—	1460	—	—
359	—	190	188	140	138	124	133	104	100	69	52	25	96	73	96	73	B C	1560	—	—
360	—	192	188	138	132	117	127	102	90 ¹	65	53	25	89	80	89	80	A	1435	—	—
361	—	183	183	134	134 ¹	121	135	107	97	71	54	25	91	77 ¹	91	77 ¹	B	1400	—	—
364	—	179	179	135	135	120	131	102	99	73	50 ¹	25	97	70 ¹	97	70 ¹	B C	1425	—	—
366	—	179	179	136 ¹	133	120	129	98	95	78	52	25	97	69 ¹	97	69 ¹	A	1375	—	—
367	—	184	182	130 ²	136	118	133	106	99	74	55	32	93	74	93	74	A B	1430	—	—

MALES

Ptolemaic period

ABSOLUTE MEASUREMENTS

OF EGYPTIAN SKULLS

Specimen No.	Glabello-Occipital Length	Occipital Length	Basal Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
368	188	187	141	126	133	115	127	94	70	51 ¹	24	92	75	A	1475
370	178	178	135	129	118	129	102	95	67	78 ¹	27	93	75 ¹	A	1320
371	180	179	137	129	113	127	102	93 ¹	67	54 ¹	23	93	75 ¹	A B	1330
374	180	177	125	131	—	—	—	96	88	48	23	92	74 ¹	A	1255
376	180	178	130	139	121	131	100	94	75	53	25	94	71	A	1385
377	182	182	124	144	122	130	96	86	70	50	25	90	75	A	1380
378	186	185	131	141	123	134	105	97	71	53 ¹	27 ¹	92	75 ¹	A	1460
381	192	191	131	130	119	134	105	98	73 ¹	53	26	93	74	A B	1390
383	181	181	126	133	115	127	101 ¹	93	70	51 ¹	24	92	75	A	1325
385	188	187	126	138	118	127	94	70	73 ¹	54	26	93	75	D	1390
386	183	180	142	131	118	132	106	95	67	53 ¹	26	90	79	A	1450
390	183	181	138	136	118	128 ¹	102	97	67	55	24	95	74	B	1460
391	191	189	136	132	114	123	100 ¹	92	63	52	23	92	76	A	1460
392	184	182	130	135	118	128	101	100	69	51	27	99	70	C D	1375
395	185	185	135	142	118	130	100	98	72	57	29	98	69 ¹	B C	1310
397	190	190	133	128	116	125	103	102	71 ¹	52	24	98	70	C D	1375
398	195	191	134 ¹	132	126	138	104	97	74 ¹	57	25	93	73 ¹	C D	1465
399	184	181	130	137	126	—	94 ¹	95 ¹	70	51	26	101	67 ¹	C D	1390
403	192	192	136	133	123	134	110	95	74	53	26 ¹	86	80	A	1475
404	181	179	128	133	112	123	107	103	77	57	26	94	72	B	1310
405	179	178	128 ¹	130 ¹	113	123 ¹	100 ¹	94 ¹	72	50 ¹	24	94	72	A	1265
407	189	189	131	136	117	126 ¹	102	93	65 ¹	46	25 ¹	91	78	A	1435
409	175	172	127	128	121	129	92 ¹	88	62	46	23	96	73 ¹	A	1210
411	172	172	126	132	114	125	94	91 ¹	73	51	27	97	68	A B	1215
412	189	188	130	132	117	124	105	95	66	43	24	91	79	A	1380
414	177	176	130	143 ¹	117	126	99	97	70	51	28	98	70 ¹	B	1400
416	192	190	136	136	122	128	101	97	68	50	30 ¹	93	72 ¹	B C	1510
417	180	179	132 ¹	135	122	130	94	89	72	54	27	95	70	A	1365
420	190	189	134	133 ¹	120	130	98	93	69	53	24 ¹	95	72 ¹	A B	1440
421	182	182	132	135 ¹	120	127	102	95	73	50 ¹	24	93	73 ¹	A	1355
422	178	173	128	140	125	136	103	95	72	53 ¹	24	92	74 ¹	A	1420
427	181 ¹	180 ¹	133	139	117 ¹	128 ¹	94	86 ¹	73	51	23 ¹	95	72	A B	1470
429	188	188	136	135	120	130	100	95	70	49	24	95	72	A	1390
430	184	182	127	140	121	132	97	91	71	51	29	94	72	A	1240
431	180	179	136	139	120	132 ¹	105	97	72 ¹	54	26	92	75	A	1380
433	168	168	123	141	119	125	100 ¹	93 ¹	66 ¹	53	25	93	75 ¹	B	1445
437	181	180	130	136	119	129	101	98 ¹	70	53	25	92	75	A	1360
440	185	181	133	127	117	129	98	93	71	50	26	95	72	A B	1300
441	173	172	126	134 ¹	117 ¹	123	97	91	71	51	29	94	72	A	1240
442	192	188	131	129	113 ¹	125 ¹	105	97	72 ¹	54	26	92	75	A	1380
444	186	184	132	140	123	136 ¹	103	97	76	55	25	100	68	C	1460
448	185	184	135	140	120	134	106	95 ¹	73	56	27	90	76 ¹	A	1570
450	183	181	128	132	118	127	97	101	68	51	29	104	67	E F	1315
452	182	181	134	138	125	134	98	90	70	52	27 ¹	92	74	A	1430
453	185	184	128	141	125	130	97	84 ¹	64 ¹	53	26	—	80	A	1420
454	183	182	138	133	123	135	103	97	79	52 ¹	29	94	70 ¹	A	1430
457	171	171	127	129	110	120	96	98	69	49 ¹	21 ¹	102	67	D E	1190
458	190	188	136	140	125	132	100	92	75	53	26	92	72 ¹	A	1540
460	182	179	127	129	116	127	101	104	74	52	27	103	66	E	1270
462	171	170	121	131	110	120	93	93	66	46	25	100	69	C D	1150
463	186	184	128	132	116	126	103	101	68 ¹	49	24	98	71 ¹	C D	1335
464	180	178	134	133	116	122	95	87	72	54	24	92	72	A	1365
465	183	183	132	132	116	124	102	98	71	68	49	91	76 ¹	A	1360

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MALES

Ptolemaic period

ABSOLUTE MEASUREMENTS

OF EGYPTIAN SKULLS

Specimen No.	Glabello-Occipital Length	Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
466	190	188	128	147	113	128	98	100	79	26	102	65	B C	1520
468	186	184	130	139	119	130 ²	106	101	88	55	97	68	A	1430
471	188	187	129	137	119	126	98	96	67	49	93	71	C	1415
472	180	178	135	130	113	125	97	97	82	60	100	65	B	1315
473	183	176	130	137	121	132	106	98	68	55	93	76 ¹	B	1385
474	185	184	129	133	122	134	106	106	65	49 ¹	100	72	D E	1350
475	180	179	138	138	112	123	96	90	74	22	94	70	A	1460
476	186	183	131	141	—	—	—	—	—	—	—	—	—	—
477	190	187	123	137	116	126	95	91 ¹	67	50	96	71	B	1360
479	187	185	131	136	110	119	99	95	66	49	96	73	B C	1115
480	180	174	126	126	111	124	105	91	70	57	97	80	A	1235
486	189	187	134	130	118	130	103	92 ¹	75 ¹	26	90	74 ¹	A	1400
487	179	177	127	138	117	133	97 ¹	86 ¹	62	47 ¹	89	80	A	1335
489	189	186	138	126	114	128	110 ¹	101	68	52	91	78 ¹	A	1400
495	193	188	138	136	115	128	103 ¹	97	81	38	94	70	A	1510
496	171	167 ¹	126	126	116	124	94	92	65	45	94	71	C	1155
497	174	173	132	132	120	131	104	99	73	55	92	72	A B	1290
501	183 ¹	182	135	139	118	122	98	92	74	54	95	71	A	1460
502	183	181	120	143	118	126	100	95 ¹	70 ¹	51	95	72	—	1340
503	181	180	136	141 ¹	120	138	100	101	72	54	28	61	C D	1175
505	184	181	135	135	118	130	106	95	73 ¹	56	96	76 ¹	A	1425
506	190	187	134	137 ¹	121	130	102	93	72	53	94	75	A	1485
508	182	181	135	142	109	120	102	96	73	52	94	72 ¹	A	1485
509	184	184	134 ¹	139	118	123	100	95	67	47 ¹	95	73	B	1460
511	182	181	125	138	120	130	100	99	72	51	27	69	C	1330
512	192	190	135	137	118	132 ¹	107	96 ¹	66 ¹	54	27	80 ¹	—	1510
515	187	186	125	133	114	119	99	92	65	50	92	76	A B	1320
516	172	172	129	145	123	126	94	89	67	47	95	72	A B	1370
517	176	175	136	138	117	—	99	92	64	46	93	76	A B	1400
520	184	183	129	131	115	125	100	97	64	44	88	73	B C	1320
521	169	166	126	143	118	125	92	88	80	54	96	66	A	1295
522	177	175	124	134	117	127	99	91	72	55	97	92	A	1250
527	179	176	127	132	117 ¹	124	99	97	72	52	98	69 ¹	B C	1275
532	181	176	125	137	120	125	94	85	72	26	90	72 ¹	A	1315
533	183	182	131	132	113	124 ¹	97	92 ¹	69 ¹	57	95	—	A	1345
540	174	173	128	129	116	128	91	81	70	52 ¹	89	73 ¹	—	1290
541	190	189	135	140 ¹	109	—	105	103	66	48	92	73	D	1530
542	176	174	129	147 ¹	125	134	95	87	67	48	92	74 ¹	A	1120
543	177	174	133	136	—	—	99	97	68	51	98	71	C	1360
544	183	181	133	145	115	127	103	102	69	49	99	70 ¹	C D	1500
547	183	183	138	141	126	140	108	99	72	50	92	76	A	1510
548	183	180	126	149	119	129	93	96 ¹	78	55	95	—	—	1460
549	178	175	128	138	120	132	93	92	72	—	99	67 ¹	B	1335
553	192	188	130	138	120	128 ¹	104	96	66	47	92	77	A	1465
554	167	166	128	132	110	122	91 ¹	87	69	50	93	70	A	1290
555	171	170	132	132	120	124	97	88	67	51	95	71	A	1270
556	191	189	136	140	116	127 ¹	101	100	81	53 ¹	27	99	B	1550
557	180	178	128	140	—	—	102	102	69	53	93	70	C D	1370
560	187	183	125	127	123	131	104	95	69	52	95	71	A	1260
562	184	181	133	137	111	125	99	98	71	48	99	69	C	1360

MALES

Absolute Measurements
of Egyptian Skulls

Roman period

FEMALES

Absolute Measurements
of Egyptian Skulls

Early Predynastic

	Glabello-Occipital Length	Optic-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Height	Nasal Width	Flower's Alveolar Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
<i>Specimen No.</i> 564	176	174	130	146	122	134	95	91	65	49	28	96	72½	B C	1420
567	174	172	126	135	116	126	98	92	80	54½	22	93	70	A	1420
569	183	184	127½	134	118	126	98	95	76	54½	24	97	69	A B	1325
570	181	180	133	129	115	125	103	95	70	56	26½	92	75	A	1325
572	186	185	138	128	112	129	106	92	69	52½	24	87	81	A	1400
573	189	188	132	133	123	129	105	104	79	56	29	99	68	B C	1465
574	173	168	133	140	121	135	102	94	71	53	26	92	74½	A	1370
578	172	171	139	137	124	133	102	95	69	52	25	93	74½	A B	1390

FEMALES

Early Predynastic

From ABYDOS

<i>Specimen No.</i>	2 S	4	6 S	8 S	10 S	14	16 S	18 S	20 S	22 S	24 S	26 S	28 S	30 S	32	34 S	36 S	38 S	40 S	42 S	44 S	46 S	48 S	50	52 S	54 S	56 S	
175	175	175	176	175	177	176	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187
176	176	176	176	175	177	176	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187
177	177	177	176	176	175	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
178	178	178	177	177	176	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
179	179	179	178	178	177	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
180	180	180	179	179	178	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
181	181	181	180	180	179	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
182	182	182	181	181	180	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
183	183	183	182	182	181	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
184	184	184	183	183	182	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
185	185	185	184	184	183	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
186	186	186	185	185	184	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
187	187	187	186	186	185	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
188	188	188	187	187	186	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
189	189	189	188	188	187	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
190	190	190	189	189	188	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
191	191	191	190	190	189	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
192	192	192	191	191	190	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
193	193	193	192	192	191	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
194	194	194	193	193	192	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
195	195	195	194	194	193	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
196	196	196	195	195	194	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
197	197	197	196	196	195	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
198	198	198	197	197	196	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
199	199	199	198	198	197	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
200	200	200	199	199	198	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
201	201	201	200	200	199	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
202	202	202	201	201	200	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
203	203	203	202	202	201	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
204	204	204	203	203	202	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
205	205	205	204	204	203	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
206	206	206	205	205	204	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
207	207	207	206	206	205	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
208	208	208	207	207	206	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
209	209	209	208	208	207	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
210	210	210	209	209	208	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
211	211	211	210	210	209	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
212	212	212	211	211	210	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
213	213	213	212	212	211	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
214	214	214	213	213	212	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
215	215	215	214	214	213	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
216	216	216	215	215	214	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
217	217	217	216	216	215	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
218	218	218	217	217	216	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
219	219	219	218	218	217	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
220	220	220	219	219	218	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
221	221	221	220	220	219	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
222	222	222	221	221	220	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
223	223	223	222	222	221	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
224	224	224	223	223	222	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
225	225	225	224	224	223	183	182	179	181	178	169	176	181	180	169	178	175	181	184	180	186	185	181	179	180	178	187	187
226	226	226	225	225	224	183	182	179	181	178	169	176	181	180														

FEMALES

Late Predynastic

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From EL AMRAH		Glabella- Length	Ophtyo- Length	Basal- Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal- Alveolar Length	Nasal- Alveolar Height	Nasal Height	Nasal Width	Flower's Index	Goniotic Angle	Prognathism or Ortho- gnathism	Estimated Cranial Capacity	
Specimen No.	322	183	179	129 ²	133	—	128	100	92	70	52	25 ¹	92	74 ¹	A	1310	
	324	179	179	132	130	—	126	102	103	65	46 ¹	27	101	70	DE	1310	
	326	182	179	—	133	—	—	—	—	—	—	—	—	—	—	—	
	From HOU																
	1004	177	176	130	138	112	117	93	91	65	45	25	98	69	BC	1350	
	1006	179	179	134	131	112	119	99	95	58	44	23	96	76	C D	1340	
	1008	173	170	124	132	108	114	95	95	64	51	25	100	70	C D	1200	
	1010	177	177	131	135	113	124	94	96	65	45	28	102	68	D	1380	
	1012	175	175	132	139	116	121	92	92	67	48	25	100	68	C	1380	
	1014	169	169	126	130	107	115	95	90	63	50	23	95	74	B	1190	
	1016	179	179	129	137	115	122	103	103	70	47	24	100	70	C D	1350	
	1018	178	177	131	128	112	122	103	103	89	68	49	22	96	71	B	1265
	1022	172	172	118	131	111	111	93	89	63	49	22	96	71	BC	1180	
	1024	170	170	126	124	109	120	96	93	64	46	24	97	72	BC	1180	
1028	176	175	122	125	112	119	88	89	61	45	21	101	68 ¹	D	1140		
1030	176	176	135	128	110	121	99	94 ²	65	46	24	95	74	—	1290		
1032	180	179	129	135	112	117	101	93	67	48	24	92	76	—	1330		
1034	177	177	126	127	—	—	97	100	69	50	25	103	67	E	1205		
1036	177	173	126	126	111	117 ²	91	87	72	51	24	96	68 ¹	AB	1170		
1038	173	173	132	132	104	115	95	99	71	50	25	104	65	D	1315		
1040	177	177	132	132	104	115	95	99	71	50	25	104	65	D	1315		
1042	171	171	122	135	—	—	—	—	—	—	—	—	—	—	—	1200	
1044	181	171	134	127	115	—	—	101	97	62	47	25	96	—	C	1240	
1046	173	182	130	133	114	119	95	99	72	48	28	104	65	D	1350		
1048	182	182	128	139	108	113	90 ²	90	64	46 ²	25	100	68 ¹	—	—	1380	
1050	173	173	134	120	109	122	102	102	96	73	53	23	94	72 ¹	A	1180	
1052	168	168	119	128	113	—	—	89	87	67	47	23	98	69	BC	1090	
1056	191	190	137	128	—	—	—	—	—	—	—	—	—	—	—	1420	
1060	170	169	124	131	111	115	88	93	62	47	21	106	65	F	1175		
1062	174	174	128	134	115	122	95	90	67	46	22	95	72	AB	1270		
1064	165	165	121	131	115	—	—	87	92	59	45	25	106	65	F	1110	
1068	177	177	130	134	116	—	—	98	98	68	47	29	105	64 ¹	DE	1310	
1070	186	186	135	135	117	131	97	104	69	48	26	107	64	F	1440		
1072	185	185	130	132	109	—	—	96	102	64	49	23	106	65 ¹	FG	1295	
1074	184	184	139	144	116	122	102	102	98	67	50	26	96	73	BC	1300	
1076	174	173	135	125	111	124	101	101	98	68	48	26	97	72	BC	1250	
1080	183	183	132	129	114	120	103	98	98	—	49	28	95	—	—	1330	
1084	177	177	131	136	115	—	—	—	—	—	46	25	—	—	—	1310	
1090	180	180	128	132	112	119	96	102	64	49	23	106	65 ¹	FG	1295		
1092	183	183	122	137	114	123	94	93	68	50	26	99	69	C	1300		
1094	176	176	127	135	115	124	103	99	99	73	54	29	96	71	B	1280	
1096	184	184	131	128	—	—	—	105	102	69	47	22	97	72	BC	1310	
1098	181	181	139	136	116	128	104	101	73	50	28	97	71	BC	1455		
1100	180	180	128	129	106	111	99	92	60	44	24	93	78	B	1265		
1102	178	177	128	139	121	131 ²	99	95	71	52	24	96	71	B	1355		
1104	181	181	126	136	112	—	—	98	93	71	53	23	95	72	AB	1320	
1106	174	174	129	131	119	125	95	93	65	47	24	98	71	C	1250		
1108	187	187	—	143	—	—	—	—	—	—	—	—	—	—	—	—	
1110	185	185	137	137	—	—	—	—	—	—	—	—	—	—	—	1480	
1112	176	176	129	123	108	116	98	99	99	65	49	24	101	69 ²	DE	1190	
1114	170	170	123	127	108	123	94	93	93	59	45	25	99	71 ¹	D	1130	
1116	178	178	—	124	110	119	—	—	—	—	—	—	—	—	—	—	

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FEMALES

Late Predynastic

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From HOU	Glabele- Length	Ophtyo- Length	Basl- Length	Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basl- Nasal Length	Basl- Alveolar Length	Nasal- Alveolar Height	Nasal Height	Nasal Width	Flower's Index	Gnathic Angle	Prognathism or Ortho- gnathism	Estimated Cranial Capacity
Specimen No. 1120	170	169	129	135	118	126	98	98	94	70	51	27	96	71 ¹	B	1260
1122	179 ¹	179 ¹	134	136	109	123	99	99	99	66	50	24	100	70	CD	1290
1124	177	176	128	132	108	120	96	96	94	63	48	26	98	72	CD	1270
1128	177	177	126	132	110	118	95	101	101	66	48	27	106	65	F	1250
1132	170	170	129	126	111	121	97	96	96	68	50	23	99	69 ¹	C	1175
1134	177	176	125	128	110	—	100	94	69	48	26	94	73	A	1200	
1136	180	180	128	132	112	123	102	95	66	46	29	93	76	AB	1295	
1138	171	170	124	132	116	125	98	103	66	45	24	105	66 ¹	EF	1190	
1140	171	171	126	133	114	119	97	96	70	48	26	99	69	C	1220	
1142	182	182	126	138	121	126	101	101	96	71	51	24	95	72	AB	1345
1150	179	178	127	127	113	—	98	98	98	71	51	26	100	68 ¹	C	1230
1152	170	169	129	133	104	116	96	92	69	48	23	96	71	B	1240	
1156	177	177	132	130	114	122	96	96	96	63	45	24	100	70	CD	1290
1158	181	181	134	129	102	118	96	98	98	70	48	26	102	67	DE	1330
1162	180	180	129	135	108	117	90	87	65	47	23	97	70 ¹	BC	1330	
1168	174	174	131	131	114	122	98	97	67	48	23	99	70 ¹	CD	1270	
1174	182	182	130	133	116	124	94	89	64	46	24	95	73	B	1340	
1176	176	176	133	133	112	122	100	97	67	49	24	97	72	BC	1325	
1178	179	179	131	125	108	117	101	93	62	46	22	92	77 ¹	A	1250	
1180	176	175	130	137	119	123	95	95	95	61	44	26	100	70 ¹	D	1330
1182	173	172	129	129	110	118	99	95	66	45	22	96	73	BC	1225	
1184	176	176	130	131	107	120	93	95	65	44	27	102	68	DE	1275	
1186	180	180	129	124	110	118	99	99	72	52	26	100	68	C	1230	
1188	172	172	124	131	109	122	—	—	—	—	—	—	—	—	—	1190
1190	175	175	128	129	113	121	95	90	69	48	23	94	95	71 ¹	AB	1230
1192	172	172	119	132	115	—	92	89	60	45	24	97	72 ¹	C	1145	
1194	173	173	123	127	108	118	96	93	65	47	24	97	72	BC	1145	
1196	179	178	126	131	110	122	94	96	66	47	25	102	68	DE	1260	
1198	170	170	123	124	108	117	—	—	—	—	—	—	—	—	—	1100
1200	174	174	125	129	—	—	94	88	64	48	23	94	74	AB	1190	
1204	181	180	125	134	116	120	93	94	67	48	22	101	68	D	1290	
1206	175	174	129	126	109	121	103	95	66	50	25	92	77	A	1210	
1208	177	176	133	128	114	123	102	98	68	48	24	96	73	BC	1280	
1210	176	171	123	122	108	124	100	99	65	46	24	99	71	D	1120	
1212	177	176	131	125	—	—	91	100	70	54	23	110	61 ¹	—	—	1230
1214	186	185	127	131	119	—	103	100	67	49	26	97	72 ¹	C	1315	
1216	181	181	129	135	114	118	101	96	69	47	22	95	73	B	1340	
1218	179	178	130	131	116	126	96	96	66	45	24	90	78	A	1300	
1220	171	170	120	129	113	119	88	85	66	47	23	97	69 ¹	B	1120	
1222	177	176	121	130	115	121	99	99	99	73	51	26	100	68	C	1185
1224	179	179	131	135	111	119	95	90	67	46	26	95	72	AB	1345	
1226	169	169	126	125	108	118	99	95	67	50	23	96	72 ¹	BC	1130	
1228	169	169	129	137	105	118	94	98	62	46	27	104	67	EF	1270	
1230	172	172	129	135	118	129	96	96	90	72	51	28	94	71	A	1270
1232	177	177	128	136	109	116	93	88	70	51	23	95	70 ¹	A	1310	
1234	189	189	132	138	116	126	99	95	67	50	25	96	72 ¹	—	—	1465
1236	178	178	126	126	114	125	98	99	62	49	25	101	70	DE	1230	
1246	184	182	128	137	111	122	98	97	68	54	26	99	70	CD	1380	
1248	172	172	129	135	118	129	96	96	90	72	51	28	94	71	A	1270
1250	184	184	124	128	111	124	95	91	66	44	27	96	72	BC	1240	
1256	173	177	124	130	110	—	94	92	69	50	25	95	69	BC	1220	
1258	178	172	126	127	109	118	95	91	71	51	23	96	70	AB	1180	
1260	175	175	122	125	115	—	97	94	65	45	23	97	72	BC	1120	
1262	173	175	129	132	119	126	96	96	95	67	49	97	69 ¹	C	1250	

FEMALES
1st dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From EL AMRAH										From HOU															
Specimen No.	526	528	530	532	534	536	538	540	542	544	546	548	1130	1238	1240	1242	1252	1266	1270	1274	1282	1286	1290	1292	
Glabello Length	179	176	178	178	174	178	185	173	180 ¹	177	182	188	182	176	181	176	173	185	170	176	174	173	176	176	172
Opto-Occip Length	179	179	178	178	174	178	185	172	178 ¹	177	181	188	182	176	181	176	173	184	170	176	174	173	176	176	172
Bas-Brain Height	129	132	127	127	125	133	135	126	136 ¹	131	130	132	125	133	126	123	123	122	129	128	124	123	125	125	125
Maximum Breadth	138	124	137	137	135	139	135	131	135 ¹	131	125	133	136	136	135	135	132	145	123	121	126	129	128	128	126
Biantr Breadth	—	—	—	—	—	—	—	—	—	—	—	—	117	116	115	115	112	116	113	111	108	108	110	110	110
Bizygomatic Breadth	120	123	—	—	123	121	116	120	116 ¹	123	129	128	—	125	127	124	116	123	—	121	119	113	118	118	118
Bas-Nasal Length	95	91	—	—	96	99	93	99	96	106	106	106	97	97	95	97	90	97	96	98	91	92	90	93	93
Bas-Alveolar Length	86	91	—	—	95	96	92	89	92	96	94	100	97	97	87	97	89	97	95	96	88	94	90	90	97
Nas-Alveolar Height	65	65	—	—	66	66	66	68	63	64	70	72	73	66	68	68	65	67	67	68	66	69	69	69	69
Nasal Height	50	44	47	47	46	46	48	49	53 ¹	41	47	48	50	48	51	50	47	46	49	51	48	48	42	51	48
Nasal Width	26	22	23	24	24	25	22	24	23 ¹	22	23	—	25	26	26	26	27	24	27	29	27	25	25	27	25
Flower's Index	90 ¹	100	—	99	98	93	93	90	98	100	89	94	100	100	102	99	99	99	99	98	97	102	100	100	104
Ganthe Angle	76 ¹	69	—	—	72	75	70	76 ¹	73	79	74	68	68	73 ¹	73	69	69	70	69 ¹	71	70	70	67	65	65
Prognathism	— A	C	—	CD	CD	A B	A B	— A	D	CD	— A	— A	C	CD	A B	C	C	CD	C	C	E F	E F	BC	D	D
Estimated Cephal Capact	1260	1225	—	1220	1175	1300	1365	1215	1315	1280	1395	1405	1315	1245	1310	1185	1195	1390	1145	1160	1200	1180	1245	1150	1150

FEMALES | **ABSOLUTE MEASUREMENTS**
ate Predynastic OF EGYPTIAN SKULLS

From HOU		Glabello-Occipital Length	Occipital Length	Opticorytho Length	Basir-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basir-Nasal Length	Basir-Alveolar Length	Nasir-Alveolar Height	Nasal Height	Nasal Width	Flower's Index	Gnathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
1st dynasty																	
From ABYDOS																	
Specimen No.		58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88
179	174	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158	157
178	177	176	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161
177	176	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
176	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160	159
175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158
174	173	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158	157
173	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158	157	156
172	171	170	169	168	167	166	165	164	163	162	161	160	159	158	157	156	155
171	170	169	168	167	166	165	164	163	162	161	160	159	158	157	156	155	154
170	169	168	167	166	165	164	163	162	161	160	159	158	157	156	155	154	153
169	168	167	166	165	164	163	162	161	160	159	158	157	156	155	154	153	152
168	167	166	165	164	163	162	161	160	159	158	157	156	155	154	153	152	151
167	166	165	164	163	162	161	160	159	158	157	156	155	154	153	152	151	150
166	165	164	163	162	161	160	159	158	157	156	155	154	153	152	151	150	149
165	164	163	162	161	160	159	158	157	156	155	154	153	152	151	150	149	148
164	163	162	161	160	159	158	157	156	155	154	153	152	151	150	149	148	147
163	162	161	160	159	158	157	156	155	154	153	152	151	150	149	148	147	146
162	161	160	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145
161	160	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144
160	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144	143
159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144	143	142

FEMALES
5th dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From DESHASHEH	Glabell. Length	Occipital Length	Occipital Breadth	Basal Length	Basal Breadth	Alveolar Length	Nasal Length	Alveolar Height	Nasal Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
Specimen No. 55	171	171	134	95	92	92	45	—	26	97	—	—	—	1325
56	173	172	136	94	87	87	47	—	24	93	—	—	—	1390
57	168	167	133	92	84?	84?	49	—	23	91	—	—	—	1245
58	176	175	135	99	99	99	54	—	27	94	—	—	—	1325
59	179	179	131	98	92	92	54	—	27	94	—	—	—	1395
60	170	164	—	—	—	—	50	—	22	—	—	—	—	—
61	192	187	137	—	—	—	55	—	—	—	—	—	—	—
62	178	180	134	99	—	—	53	—	—	—	—	—	—	1365
63	178	175	139	99	87	87	52	—	25	88	—	—	—	1450

6th-12th dynasties

From DENDERAH	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	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FEMALES
6th-12th dynasties

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From DENDERAH	Glabell. Length	Occipital Length	Occipital Breadth	Basal Length	Basal Breadth	
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FEMALES

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

FEMALES
6th-12th dynasties

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

FEMALES
6th-12th dynasties

From DENDERAH		Occipital Length	Occipital Breadth	Occipital Height	Basal Length	Basal Breadth	Basal Height	Alveolar Length	Alveolar Breadth	Alveolar Height	Nasal Width	Flower's Index	Gonial Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
Specimen No.	197 S	174	128	130	115 ²	127	96	91	67	50	24	95	72 ¹	A B	1230
198 S	165	165	132	129 ¹	110 ¹	115	96	82	66 ¹	51 ¹	26	85	80	A	1195
201 S	177	177	180	129 ¹	102 ¹	108	95	90	68	50	24	95	72	A B	1265
202 S	181	181	136	131	114	124	100	94	74	49	25	94	71 ¹	A B	1270
205 S	173 ¹	173	131	124	111	122	101	95	69	51	24	94	73 ¹	A B	1195
207	180	180	136	128	118	121	101	91	64 ¹	46 ¹	23	90	78	A	1385
210 S	171	171	136 ¹	140	107	117	92	80 ²	55 ²	45	21	—	88 ²	—	1385
213 S	177	177	128	131 ¹	105	117	95	90	68	50	25	95	72	A B	1260
216 S	176	176	133 ¹	130	102 ¹	114	90 ¹	93	66	47	24	103	67	E	1295
217 B	180	180	137	137	110	115	99	101	66	51	25	102	69	E	1435
218 S	166	165	123	132 ¹	105	118 ¹	94	85	60	44 ¹	21	90	77 ²	—	1145
225 S	176	176	129	136	113	122	96	95	70	50	25	99	69	C	1315
226	183	182	132	134	131	—	97	94	70	49	27	97	70 ¹	B C	1375
227 S	184	184	131	137	110	117	95	89	59	43	21 ¹	94	76 ¹	B	1405
230	174	174	128	127	109	—	95	90	69 ¹	51	22	95	71 ²	A B	1205
232 S	175	175	121	140	116	118 ¹	95	90	72	55	26	95	70	A	1260
235 S	191	191	133 ¹	106	110	124	101	92	60	50	26	—	74	—	1145
236 S	176	175	134	135	109 ¹	116	100	94 ¹	67 ¹	50	27	95	70	—	1355
237 S	176	176	138	133	108	118	98	87	63	44	23	89	80	A	1375
238 S	179	178	126	126	106	118	97	95 ¹	71	49	23	99	69	C	1210
239 S	172	172	133	135	108	115	92	93	70	48	27	101	67	C D	1315
241 S	177	177	135 ¹	127 ¹	113	124	94	90	67	49	23	95	71 ¹	A B	1290
242 S	171	171	129 ¹	128	107	114	94	89	64	47	26	95	72	A B	1360
249 S	173	173	130	130	105	112	93	93	71	47 ¹	27	100	67	B C	1245
250 S	165	165	124	127	106	110 ¹	93	89	66	49	23	96	71 ¹	B	1105
251	176	176	131	129	113	—	98	92	67	50 ¹	23	94	74	A B	1265
256 S	178	177	135 ¹	127 ¹	113	124	94	89	67	47	26	95	72	A B	1360
260 S	182	182	135	131	111	117	97	95	64	44 ¹	28	98	71 ¹	C D	1370
263 S	171	171	128	126	108	112	95	91	66	48	24	96	72	B C	1175
264 S	177	176	129	133	109	116	93	92	67	46	23	99	69	C	1290
267 S	181	181	134	141	118	125	101	97	70	50	26	96	72	B C	1455
269 S	172	170	126	130	115	121	95	92	74	52	26	97	68 ¹	A B	1200
271 S	176	176	128	125	103	115	95	93	69	49	24	93	69 ¹	B C	1260
273 S	167	167	133	131	106	117 ¹	97	94	66	43	27 ¹	97	72	B C	1240
275 S	175	175	125	125	111	116	98	97 ¹	60	44	24 ¹	99	72	D	1160
277 S	171	171	125	129	111	119	91	92	67	49	25 ¹	101	67 ¹	D	1175
280 S	172	172	130	123	106	—	93	92	70 ¹	48	26	99	68	B C	1170
284 S	171 ¹	171 ¹	122	136	113	—	93	91 ¹	63	46	25 ¹	98	71	A	1210
287 S	171	171	121	128	108	120 ²	95	89	67 ¹	49	31	94	73	C	1125
290 S	175	174	126	134	110	117	92	91	67 ¹	47	25	98	69	B C	1260
296 S	175	174	135 ¹	129	110	118	101	94	67	49	25	93	75	A B	1300
297 S	185	184	127	126	114	119 ²	99	94	72	53 ¹	27	95	71 ¹	A B	1260
299 S	171	171	130	125	104	118	100	95	71	51	28	95	72	A B	1180
303 S	179	179	131	124	—	—	—	—	—	—	—	—	—	—	—
305 S	171	171	119	123	—	—	—	—	—	—	—	—	—	—	—
310 S	175 ¹	175 ¹	136 ¹	129	103	115	102	102 ¹	75	48	25	101	68	D	1305
313 S	184	183	134	137	107	119	92 ¹	92	70	—	—	100	68	C	1440
314 S	182	182	135	138	113	123	101	101	67	45	26	100	70	C D	1440
318 S	169	169	135	133	110	116 ¹	98	88 ²	65	45	25	90	—	—	—
321 S	171	169	136	137	107	116	94	86 ²	—	49	24	92	92	—	—
322 S	184	184	127	118	107	112	94	87	68	47	23	93	73 ¹	A	1175
326 S	167	167	126	132	—	—	—	—	—	—	—	—	—	—	—

From Denderah		Occipital Length	Occipital Breadth	Occipital Height	Maximum Breadth	Biantrichar Breadth	Bivergent Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Height	Nasal Width	Flower's Index	Gonial Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
Specimen No.	331 S	180	125	133	109	117	—	95	69	47	25	100	68 ¹	—	C	1270
333 S	168	167 ¹	133	136	107	118	—	99	68	50	25	100	70	—	C D	1290
334 S	175	174	132	134	110	117	—	—	—	—	—	—	—	—	—	—
12th-15th dynasties																
From Hou																
Specimen No.	2 S	179	128	129	112	116	99	93	71	49	22	94	72 ¹	A	1255	
4 S	170	170	117	122	109	114	90	84	62	44	23	93	74	A B	1030	
6 S	175	174	126	132	111	119	92	87	69	46	23	95	71	A B	1240	
8 S	170	170	125	127	108	117	92	87	63	47	23	95	73	B	1150	
10 S	181	181	127	133	105	110	96	87 ²	64 ²	50	21	91	77	—	—	1300
12 S	173	173	128	128	103	112	90	88	67 ²	49	20	98	69 ²	—	—	1205
14 S	174	174	123	131	103	113	101	96	70	50	27	95	72 ¹	A B	1190	
16 S	176	175	125	134	102	112	98	87	62	48	24	89	80	A	1265	
18 S	171	171	123	136	106	115	93	83	65	48	23	89	77	A	1270	
20 S	181	180	131	135	107	117	98	97	69	47	25	99	70	C D	1360	
22 S	179	178	128	127	109	117	100	91	69	52	25	91	75	A	1240	
24 S	174	174	129	134	—	—	93	90	61	46	24	97	72 ¹	C	1280	
26 S	180	180	123	132	107	117	117	93	65	48	29	91	74 ¹	A	1195	
28 S	176	175	123	132	107	120	96	93	71	51	25	97	70	B	1265	
30 S	173	173	124	129	114	122	96	89	68	50	26	93	73 ¹	A	1180	
32 S	182	181	128	140	116	121	96	91	70 ²	50	25	95	71 ¹	—	—	1390
34 S	176	176	126	135	110	118	98	95	64	48	25	97	72 ¹	C	1275	
36 S	171	171	128	129	114	120	94	89	68	49	26	95	71 ¹	A B	1200	
38 S	174	174	129	121	105	116	92	92	69	50	23	97	72	A B	1155	
40 S	177	177	131	129	113	120	95	97	67	48	23	92	74 ¹	A	1270	
42 S	171	171	123	126	106	113	98	90	65	43	26	97	71	B C	1130	
44 S	172	172	125	128	109	119	93	95	67	44	26	102	67	D E	1170	
46 S	178	178	128	130	111	121	92	94	69	43	25	102	66	C	1260	
48 S	179	179	123	133	115	122	89	85	72	51	25	95 ¹	68	A	1245	
50 S	176	176	131	124	—	—	99	85	70	—	—	86	78 ¹	A	1215	
52 S	179	177	123	138	110	118	97	95	70	49	26	98	70	C	1295	
54 S	173	173	123	130	111	118	95	93	66	50	23	98	71	C	1180	
56 S	173	173	124	136	111	122	93	94	66	49	24	101	68	D	1240	
58 S	177	176	127	130	109	117	95	93	68	48	26	98	69	B C	1245	
60 S	180	180	132	131	111	118	97	96	73	49	26	99	68	B C	1325	
62 S	179	179	139	129	113	121	100	85	71	51	26	85	79	A	1365	
64 S	172	172	123	132	110	117	91	86	64	48	22	94 ¹	72 ¹	A	1160	
66 S	181	181	131	132	114	120	102	96	71	51	26	94	73 ¹	A B	1300	
68 S	165	165	124	138	110	113	91	85	64	47	24	93	73	A	1200	
70 S	177	177	126	131	109	118	98	92	62	47	24	94	76	B	1245	
72 S	176	176	123	135	105	113	91	88	59	44	25	97	72 ¹	C	1245	
74 S	174	174	127	132	113	119	88	86	69	50	21	98	68	B	1145	
76 S	174	173	127	131	120	123	98	89	69	48	26	91	75	A	1230	
78 S	175	175	123	133	116	123	89	88	71	49	26	99	67	B	1220	
80 S	177	177	123	133	108	116	94	90	66	48	22	96	72	B C	1230	
82 S	196	196	137	133	109	125	104	97	69	49	26	93	75	A B	1520	
84 S	175	175	119	132	112	116	92	93	67	45	26	101	67 ¹	C D	1170	
86 S	179	179	132	133	112	117	92	81	70	48	23	98	74	A	1340	
88 S	179	177	128	128	111	120	97	93	69	51	25	96	71	B	1345	
90 S	174	174	123	132	108	113	91	83	65	49	21	91	74 ¹	A	1200	
92 S	172	172	124	118	107	116	96	92	58	41	25	96	75	C	1070	

FEMALES
12th-15th dynasties

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From HOU	Glabella Length	Orbitary Length	Basal Length	Basal-Nasal Length	Basic Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Capacity
<i>Specimen No.</i> 94 S	175	174	126	95	89	72	49	94	71	A	1219
96 S	163	173	119	94	93	64	47	99	71	CD	1185
96 S	163	173	127	88	84	61	44	92	72	A B	1160
100 S	176	176	129	95	90	66	47	95	72½	A B	1265
102 A	172	172	127	90	85	59	44	94½	74	A B	1260
102 B	165	168	131	95	94	68	49	99	69	C	1175
104 S	190	190	129	104	103	63	47	99	73	D E	1385
106	170	168	117	96	100	64	48	104	67	E F	1030
108 S	175	174	131	95	89	65	46	94	74	A B	1305
110 S	171	171	128	98	98	67	44	100	69	C	—
From ABYDOS											
124	169	169	127	96	93	67	48	97	71	B C	1180
126	172	172	126	95	93	66	46	98	71	C	1255
128	174	173	135	99	90	67	48	96	76	A	1300
130	166	166	127	93	93	70	48	95	69	B C	1185
132	169	169	127	96	89	62	45	99	62	C D	1240
134	182	182	132	96	86	73	54	90	73½	A	1265
136	175	174	136	94	88	69	50	94	72	A B	1385
138	169	168	132	97	87	71	47	94	75	A B	1225
140	182	181	132	95	87	71	54	92	73	A	1370
142	179	178	129	95	83	69	52	87	76½	A	1290
144	180	179	139	99	93	71	51	94	72½	A	1405
146	174	174	123	94	89	70	51	95	71½	A B	1230
148	181	181	128	96	88	70	52	92	73½	A	1305
150	176	176	136	95	87	71	54	92	73	A	1370
152	173	169	133	88	86	65	46	98	69	B C	1195
154	179	179	129	98	98	64	45	100	70½	D	1260
156	174	174	128	95	92	68	48	97	70½	B C	1260
158	174	174	129	96	86	66	46	90	77	A	1250
160	171	171	126	95	92	66	50	90	77½	B C	1115
162	176	176	132	91	85	67	49	93	72	A	1390
164	168	167	122	90	90	61	43	94	69	C	1150
166	168	168	123	93	86	64	48	92½	74½	A	1150
168	181	179	135	95	98	66	47	93	67	E	1310
170	180	180	141	92	91	69	51	99	69	A B	1385
172	179	179	131	92	86	64½	48	93	73½	—	1350
174	177	177	135	100	91	72	52	91	74	A	1340
176	182	182	130	93	89	64	50	94	70	R C	1320
178	177	177	128	101	94	70	51	93	74	A B	1205
180	169	169	133	96	86	73	51	94	70	A	1360
182	175	175	128	95	90	67	49	95	72	A B	1285
184	177	177	138	95	93	76	53	98	67	A B	1435
186	180	180	139	104	94	78	54	90	73½	A	1410
18th dynasty											
From SHEKH ALI											
<i>Specimen No.</i> 2	179	176	126	101	84	68	51	83	81½	A	1150
4	190	188	131	97	97	69	51	100	68	C	1875
6	179	179	121	98	94	66	51	94	72	B C	1250
8	179	177	129	102	96	64	46	94	77½	B C	1245
10	174	174	132	92	87	67	46	95	72	A B	1320

FEMALES
18th dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From SHEKH ALI	Glabella Length	Orbitary Length	Basal Length	Basal-Nasal Length	Basic Length	Nasal-Alveolar Height	Nasal Width	Flower's Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Capacity
<i>Specimen No.</i> 12	170	170	129	91	83	61	46	91	72	A	1280
14	181	181	131	99	99	63	45	100	70½	D	1280
16	171	171	129	93	90	62	45	97	68	A B	1210
18	165	165	122	96	95	64	47	99	71	D	1080
20	181	181	134	98	96	69	46	97	70	C	1360
22	174	174	126	94	87	62	48	93	74½	A B	1210
24	175	175	128	95	89	69	50	94	72	A	1205
26	169	169	130	95	89	69	50	94	72	A	1205
28	166	166	125	94	86	64	47	95	71½	CD	1145
30 A	176	176	138	101	93½	62	46	92	71½	—	1230
30 B	179	179	127	96	95	65	43	90	70	CD	—
32	173	173	128	93	95	63	47	102	68	D E	1270
34	179	177	128	93	89	63	45	91	76½	A	1255
36	181	181	122	99	95	66	48	92	73	B C	1125
38	181	180	138	101	89	64	50	88	80	A	1435
40	172	171	127	97	88	64	47	91	77	A	1180
42	171	173	122	94	97	67	49	103	66	D E	1165
44	176	174	124½	95	91	65	49	92	72	B C	—
46	175	175	117	90	85	51	25	91	72	A	1185
48	177	175	123	92	90	67	49	98	69	B C	1260
50	172	172	131	98	90	63	49	92	76	A	1375
52	185	185	131	100	97	64½	49	97	72	—	1330
54	185	185	129	100	97	64	49	97	71½	—	1375
56	175	174	130	95	88	62	47	93	76	A B	1210
58	167	167	128	95	88	62	47	93	76	A B	1210
60	178	177	132	100	87	66	46	87	80	A	1360
62	179	179	134	99	92	63	45	93	76½	B	1365
64	179	178	125	97	87	65	50	89	77	A	1190
66	174	174	132	94	81	64	48	86	79½	A	1270
68	178	178	123	86	86	63	46	100	67½	B C	1210
70	171	171	123	88	86	65	46	98	69	B C	1100
72	168	167	130	89	92	61	42	103	66½	D E	1225
74	183	183	140	98	91	64	48	93	75	A B	1180
76	183	183	128	101	98	70	49	97	71	B C	1265
78	183	182	127	102	96	66	49	94	74	A B	1315
80	171	170	125	96	98	67	51	102	67	D E	1210
82	179	179	132	98	98	71	51	99	69	C	1385
84	179	179	129	92	84	73	48	94	70½	A	1315
86	170	170	129	93	85	73	51	94	69	A	1165
88	180	179	124	93	92	66	45	99	69	C	1290
90	176	175	128	92	92	65	45	100	69½	CD	1315
92	177	177	125	98	—	—	—	—	—	—	1300
94	178	178	123	98	99	68	52	101	68½	D	1180
From ABYDOS											
2	182	181	119	95	90	63	48	95	73	B	1235
4	170	170	127	86	82	63	47	93	71	A B	1265
6	180	180	128	96	—	—	—	—	—	—	—
8	178	176	123	89	93	68	47	92	70	C	1265
10	167	167	122	89	93	68	47	104	65	D	1090
12	175	173	129	97	91	69	49	94	72½	A	1220
14	179	178	136	109	116	—	—	—	—	—	1325
16	173	173	129	94	87	66	48	93	71	A B	1250

FEMALES
18th dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From ABYDOS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Specimen No.	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
Glabeilo-Occipital Length	189	175	174	176	161	177	180	186	181	179	172	183	181	180	185	173	181	180	181	180	184	178	179	181	181	180	184	182	177	178	181	181	172	177	175	176	182	183	182	181	174	176	177	178	179	180	181	182	183	184																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Optymo-Occipital Length	189	175	174	176	161	177	180	186	181	179	172	183	181	180	185	173	181	180	181	180	184	178	179	181	181	180	184	182	177	178	181	181	172	177	175	176	182	183	182	181	174	176	177	178	179	180	181	182	183	184																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Basal-Bregmatic Height	132	131	124	127	130	127	133	131	131	125	128	121	121	120	132	123	130	134	130	134	136	128	129	130	130	128	132	125	177	178	180	130	124	121	130	135	136	135	134	129	130	131	132	133	134	135	136	137	138	139																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Maximum Breadth	133	136	138	138	130	137	139	138	138	134	136	139	139	139	134	136	137	138	138	136	137	135	137	137	137	136	132	126	177	178	180	132	124	121	130	135	136	135	134	129	130	131	132	133	134	135	136	137	138	139																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Biauricular Breadth	115	110	116	121	109	115	116	113	113	109	111	116	116	116	111	113	117	118	118	118	117	116	115	114	113	110	108	105	103	102	101	99	98	96	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
Bizygomatic Breadth	125	117	121	121	—	121	121	119	121	120	121	121	121	120	125	123	126	126	126	126	125	125	124	121	119	116	112	108	106	104	102	99	98	96	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
Basal-Nasal Length	101	94	93	97	91	97	97	92	92	89	92	91	89	89	89	89	88	88	88	87	86	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Alveolar Length	99	84	93	86	85	90	91	89	89	86	86	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Nasal Height	63	47	48	40	42	46	45	46	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nasal Width	26	22	24	19	22	26	26	25	25	26	26	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Flower's Alveolar Index	98	89	99	89	93	93	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20																																																																																																																																																																																																																																																																																																																																																																																																			
Gonathic Angle	—	—	70	81	72	75	73	71	70	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20																																																																																																																																																																																																																																																																																																																																																																																																																										
Prognathism or Orthognathism	—	—	C D	A	A	A	A	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C	B C

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FEMALES
18th dynasty

ABSOLUTE MEASUREMENTS
OF EGYPTIAN SKULLS

From ABYDOS		Glabeilo-Occipital Length	Ophtymo-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Bizygomatic Breadth	Basal-Nasal Length	Basal-Alveolar Length	Nasal-Alveolar Height	Nasal Width	Flower's Alveolar Index	Gonathic Angle	Prognathism or Orthognathism	Estimated Cranial Capacity	
Specimen No. 122		188	188	133	140	112	121	100	96	70	49	25	96	B C	1190	
124		176	176	125	132	117	125	92	88	74	53	26	96	A	1235	
126		179	179	126	134	104	112	98	91	56	47	28	93	B	1285	
128		175	175	126	129	108	119	95	90	65	48	21	95	B C	1210	
130		169	169	125	128	111	115	91	87	63	46	25	96	B C	1150	
132		176	174	128	130	111	121	96	90	64	50	28	94	A B	1245	
134		176	175	127	132	115	122	95	87	68	50	27	92	A	1255	
30th dynasty																
From HOU																
Specimen No. 2		182	181	130	139	114	123	96	90	72	53	23	94	A	1400	
4		175	174	131	130	109	119	99	93	59	46	25	94	A B	1265	
6		176	176	137	127	120	130	102	95	67	52	25	93	A B	1305	
8		176	176	123	130	111	121	94	91	63	46	26	97	C	1200	
10		167	167	125	126	108	116	98	87	68	50	24	89	—	1120	
12 S		178	178	114	127	115	121	96	89	68	50	21	93	A	1095	
14 S		181	180	130	127	117	122	97	86	66	49	25	89	77	A	1280
16 S		172	171	127	127	113	121	101	93	71	50	27	95	A B	1180	
18 S		173	173	125	126	116	125	97	92	65	47	25	92	B	1160	
20		177	177	133	130	119	125	95	89	66	47	22	94	A B	1300	
22		178	178	122	132	110	119	96	88	64	48	23	92	—	1220	
24 S		181	181	127	129	117	121	104	93	67	50	25	89	79	A	1260
26 S		178	173	118	127	104	114	95	91	68	50	26	96	B C	1100	
28 S		171	171	124	136	112	116	91	92	62	47	23	98	C D	1235	
30 S		177	177	127	132	113	122	97	89	67	48	24	92	A	1265	
32		175	174	124	136	113	121	99	92	69	53	24	93	A B	1255	

FEMALES

Ptolemaic period

ABSOLUTE MEASUREMENTS

OF EGYPTIAN SKULLS

From DENDERAH															
Specimen No.	Chibello-Occipital Length	Ophtymo-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Biauricular Breadth	Biaryomatic Breadth	Basal-Nasal Length	Basal Length	Nasal Breadth	Nasal Height	Nasal Width	Flower's Alveolar Index	Cranial Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
387	184	184	137	135 ¹	123 ¹	129	102 ¹	94	73	56	26	92	74	A	1450
388	180 ¹	180 ¹	126	125	105	110	93	84	61	47	23	90	78	A	1235
389	186	186	127	136	125	129	97	87	69	51	20	90	76	A	1370
393	169	169	131	131 ¹	121	126	98	90	67	48 ¹	25	92	75 ¹	A	1235
394	170 ¹	170 ¹	126	129	117	122	99	94	64	46	26	95	74	B C	1175
396	174	174	125	135	118	124	95	92	74	52	25	97	68 ¹	A B	1260
400	167	167	123	129	107	117	91	85	66	50	20	93	72	A	1180
401	184	182	124	133	120	131	96	95	65 ²	52 ¹	29	99	70 ²	—	1290
402	171	171	125	136	119	125	99 ¹	95	66	50 ²	25	96	73	B C	1240
406	181	181	130	132 ¹	110	113	93	92	65 ¹	46	23 ¹	93	75 ¹	A B	1320
408	170 ¹	170 ¹	122	—	107	116	96	—	66 ²	44 ²	27	96	71 ²	—	—
410	172	172	116	135	118 ¹	123	91	87	66 ²	49 ²	28	96	71 ²	—	1150
413	180	179	127 ¹	133	113 ¹	120	97	85	69 ²	51 ¹	26	88	77 ²	—	1290
415	181	181	129	140	120	130	97	92	65	49	27	95	74	B	1390
418	171	171	120	130	119	124	98	95	64	47	29	97	72 ¹	C	1135
419	185	183	134	138	115	—	104	96 ¹	74	54	25 ¹	93	74	A B	1455
423	171	169	124	128	114	122	95	89	67	48	26	94	73	A	1155
424	166	165	124	132	113	123 ²	98	92	66	52	23	94	74 ¹	A B	1160
425	179	179	129	137	123	129 ²	98	91	68	50	24	93	74	A B	1345
426	170	169	125	138	117	125	92	84	65	49	26	91	75	A	1250
428	171	171	126	128	112	118 ¹	95	83	66 ²	47	21	87	78	—	1170
432	176	176	123	129	111	—	96	101	59	45	24	105	67 ¹	F G	1190
434	171	171	125	136	117	120	100	93	66	48	25	93	75	A B	1235
435	167	165	128	135 ¹	119	126	101	94	70	51	25	93	74	A B	1225
436	175	175	126	134	118	123	102	96	72	51	25 ¹	94	73	A	1260
438	172	171	123	127	115	122 ¹	93	93 ¹	66	50	26	101	68 ¹	D	1140
439	177	177	137	134	110	122	98	92	66	49	25	94	74 ¹	A B	1380
443	182	182	127	136	110	115	92 ¹	88	59	42 ²	22	95	74 ¹	B C	1340
445	190	190	135	129	118	126	104	88	75 ²	56	26	85	73 ¹	—	1410
446	178	178	133	131	115	127	101	94	61	44 ¹	25	93	77 ¹	B	1320
447	176	175	125	138	114	126	100	96	66	50 ²	24	96	73	B C	1290
449	169	169	122	137	101	105	87	82	63	44	23	94	71 ¹	A	1200
451	174	174	126	133	115	121	93	92	68 ¹	52	23	99	69	C	1240
455	183	182	127	131	118	128	100 ¹	96	70	52	26	96	72	B C	1295
456	167	166	115	145	119	124	92	93	68	55	24	101	67 ¹	C D	1180
459	166 ¹	166 ¹	123	134	108	112	91 ²	83	45 ²	25	101	68 ¹	D	1170	
461	175	174	127	135	114	122	98	89	64 ¹	46	26	91	77	A	1275
467	168	167	121	138	114	121	91	86	64	47	23	95	72 ¹	A B	1190
468	165	163	127	132	117	124	95	88	71	52	24	93	72	A	1180
470	180	180	130	131	117	123	103	98	66	47	29	95	75	B C	1305
476	175	173	120	132	117	124	95	91	66	49	23	96	72	B C	1180

Roman period

From DENDERAH

Specimen No.	Chibello-Occipital Length	Ophtymo-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Birotular Breadth	Biaryomatic Breadth	Basal-Nasal Length	Basal Length	Nasal Breadth	Nasal Height	Nasal Width	Flower's Alveolar Index	Cranial Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
478	182	182	127	133	111	121 ¹	100	98	66	51	—	98	71 ¹	C D	1365
481	175	174	123	131	110	120	95	88	67	46	25 ¹	93	73 ¹	A	1200
482	177	176	130	136	117	122	97	88 ¹	69 ¹	51	21	91	74 ¹	A	1230
483	173 ¹	173 ¹	123 ¹	127	117	125	101	106	67 ²	48	22	105	68 ¹	E F	1150
484	170	170	130	127	109	115	92	89	67	47	23 ²	97	70	B	1195
485	176	176	131	134	105	115	99	99	65	44	28 ¹	100	70	C D	1315
488	183	182	131	135	113	—	100	95 ¹	66	47 ¹	25	96	73 ¹	B C	1380
490	176	175	129	133	111	124	103	97	75	52	25	94	72	A	1285

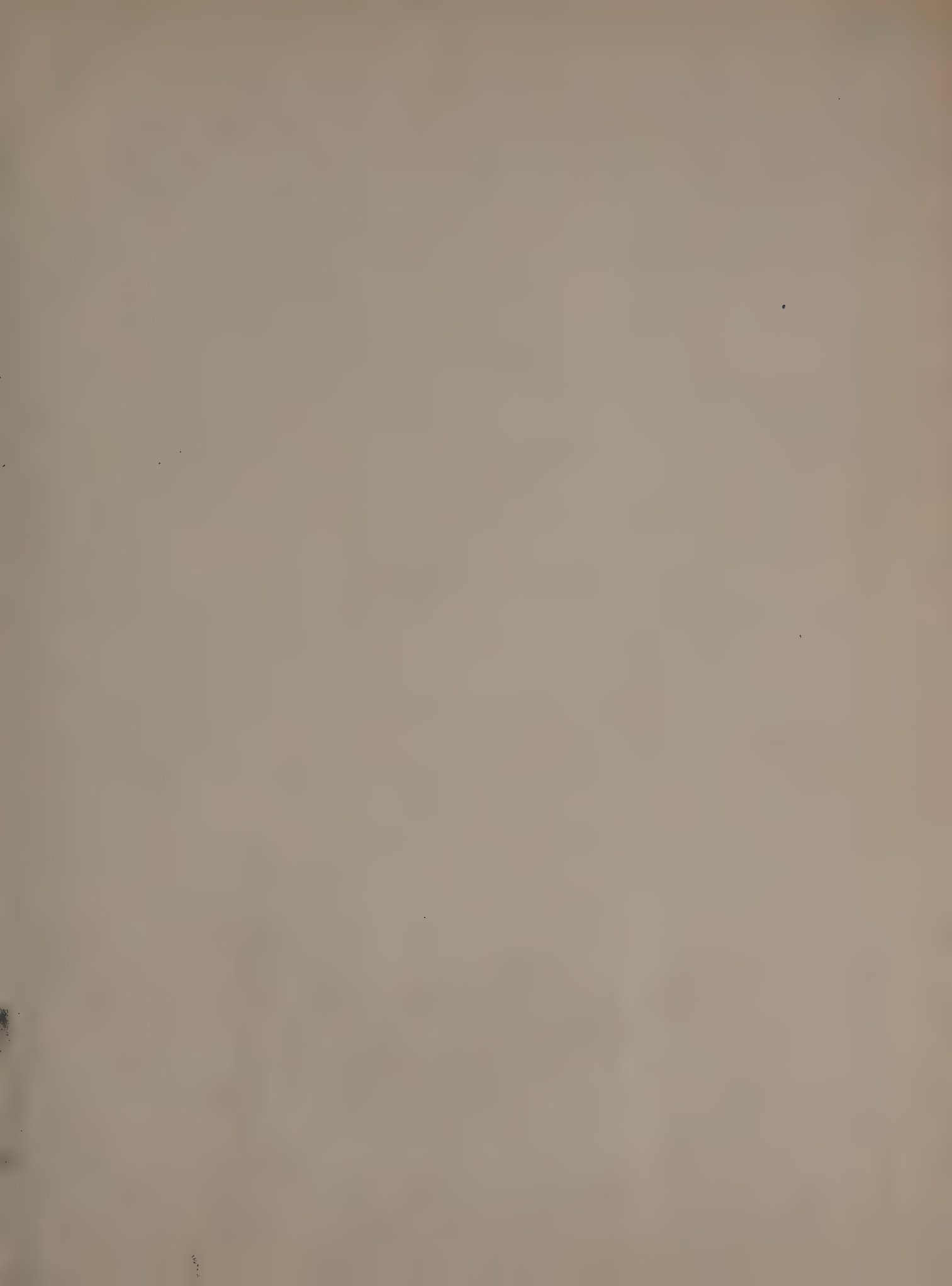
FEMALES

Roman period

ABSOLUTE MEASUREMENTS

OF EGYPTIAN SKULLS

From DENDERAH	Specimen No.	Glabella-Occipital Length	Optryo-Occipital Length	Basal-Bregmatic Height	Maximum Breadth	Birotular Breadth	Biaryomatic Breadth	Basal-Nasal Length	Basal Length	Nasal Alveolar Height	Nasal Height	Nasal Width	Flower's Index	Cranial Angle	Prognathism or Orthognathism	Estimated Cranial Capacity
	S 491	178 ¹	178 ¹	131	124	109	111	101	93	63 ²	50	26	92	77 ¹	—	1230
	S 492	176	176	127	125	110	117	104	93	69 ¹	55	22	89	78	A	1190
	S 493	166	166	124	124	107 ¹	115	95	89	64	47	24	94	74	A B	1085
	S 494	183	183	128	132	117	122	98	95	65	48	26	98	72	C D	1315
	S 498	174	173	131	125 ¹	119	128	95	93 ¹	68	48	25	98	70	C	1210
	S 499	189	189	127	133	109	120	95 ¹	96	64	46	25	101	69 ¹	D E	1360
	S 500	174	174	118	135	112	118	91	86	71	53	23	95	70	A	1180
	S 504	176	175	130	131	112	116	95	86	69	49	25	90	74	—	1275
	S 507	180	180	126	134	112	124	95	88	73	49 ¹	23	93	71	A	1245
	S 510	178	177	130	135	115	124	97	91	71	51	21	94	72	A	1325
	S 513	166	166	131	127	108	117	95	95	61	46	25	100	70 ¹	D	1175
	S 514	176	175	127	130	116	120	95	91	68	50	25	96	71	B	1235
	S 518	174	174	127	127	110	116	94	85	63	44	21	91	77	A	1195
	S 519	167	167	125	133	115	122	92	91	71	49	26	99	67 ¹	B	1180
	S 523	175	174	131	132	118 ¹	126	99	90	62	47	24	91	78	A	1285
	S 524	170	168	116	131	115	122	96	87	69	52	25	91	74	A	1100
	S 525	170	170	126	127	106	109	91	88	59	41	21	97	72 ¹	C	1155
	S 526	173	172	128	133	117	122	97	90	58	44	26	93	78	B	1250
	S 528	172	172	133	127	112	121	101	97	66	49	25	96	73	B C	1235
	S 529	179	179	131	131	105	116	104	105	65	49	27	101	71	E	1305
	S 530	179	179	129	135	112	122	99	93	—	—	—	94 ²	—	—	1325
	S 531	171	171	—	134	116	118	—	—	—	45 ¹	23	—	—	—	—
	S 534	173	172	128	133	116	120	99	95 ¹	66	46	25	97	73	C	1250
	S 535	171	171	132	126	105	112 ¹	99	92	63	48	24	93	76 ¹	B	1210
	S 536	177	177	120	129	105	115	93	90	65	47	26	97	71	B C	1165
	S 537	169	169	126	128	108	117 ²	96	85	58	47	24 ²	89	81 ¹	A	1160
	S 538	181	181	124	137	120	127	94	88	62	44	20	94	74 ¹	A B	1310
	S 539	171	171	125	143	116	125	92	87	63	46	26	95	73	B	1300
	S 546	173	173	128	145	111	—	87	80	73	52	26	92	69	—	1365
	S 551	175	174	125	128	110	116	96	92	71	47	22	96	70 ¹	B	1190
	S 552	176	176	127	131	117	124	92	90	62	43	23	98	71	C	1245
	S 558	180	180	119	128	113 ¹	121	96	93	68	46	27	97	71	B C	1165
	S 559	178	178	131	131	110	116	100	101	65 ¹	46	26	101	69	D E	1300
	S 561	170	169	116	128	112 ¹	118	94	94	65	50	22	100	69	C	1075
	S 563	171	171	115	131	115	120	99	84	—	48	26	85	—	—	1100
	S 565	167	167	118 ²	125	108	113	—	—	58	41	23	—	—	—	—
	S 566	174	174	125	125	110	118 ²	95	96	67	47	25	101	68 ¹	D	1155
	S 568	172	172	116	124	102	113 ¹	91	87	63 ¹	48 ¹	21	96	72	B C	1055
	S 571	172	172	113	136	123	128 ²	95	99	71	51	26	104	65	D	1120
	S 575	161	161	122	120	107	112	87	87	58	46	22	100	69	C D	1000
	S 576	166	166	122	133	112	116 ¹	93	92	65	47	25	98	70	C	1145
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